A PRELIMINARY FACTOR ANALYTIC INVESTIGATION INTO THE FIRST-ORDER FACTOR STRUCTURE OF THE FIFTEEN FACTOR QUESTIONNAIRE PLUS ON A SAMPLE OF BLACK SOUTH AFRICAN MANAGERS

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DECLARATION

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the owner of the copyright thereof (unless to the extent explicitly otherwise stated) and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

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OPSOMMING

Organisasies in ‘n vrye-mark ekonomiese stelsel streef daarna om die skaars hulpbronne tot hul beskikking optimal aan te wend ten einde wins te maksimeer. Om hierdie doel te bereik word die menslike hulpbronfunksie getaak met die verantwoordelikheid om ’n bevoegde en gemotiveerde werksmag te verkry en in stand te hou op ’n wyse wat waarde tot die onderneming voeg. Keuring word daardeur ’n kritieke menslike hulpbronintervensie in enige organisasie in so verre dit die beweging van menskapitaal in en deur die organisasie reguleer. Ten einde ingeligte keuringsbesluite te kan neem, benodig bedryfsielkundiges en menslike hulpbronpraktisyns betroubare en geldige inligting oor voorspellerkonstrukte om hul in staat te stel om akkurate voorspellings van die kriteriumkonstruk te maak. Dit bied wesenlik die regverdiging vir die primêre oogmerk van hierdie studie, naamlik om ‘n faktoranalitiese ondersoek van die eerste-orde faktorstruktuur van die Fifteen Factor Questionnaire Plus (15FQ+) op ‘n steekproef swart Suid Afrikaanse bestuurders te onderneem.

Die data wat in die studie gebruik is, is verkry uit die databasis van Psymetric (Pty) Ltd met die toestemming van Psytech SA. Die steekproef het bestaan uit 241 swart bestuurders wat tussen 2002 en 2006 deur Psymetric (Pty) Ltd getoets is. Item- en dimensionaliteitontledings is op die 15FQ+ subskale uitgevoer ten einde die sukses vas te stel waarmee hul die onderliggende persoonlikheidskonstrukte verteenwoordig. Die resultate van beide die item- en die dimensionaliteitontledings het aangedui dat ofskoon die items van elke subskaal die onderliggende persoonlikheidskonstruk skyn te verteenwoordig, was hulle nogtans nie sonder probleme nie. ’n Spektrum passingsmaatstawwe is gebruik om die pasgehalte van die metingsmodel te beoordeel. Die model se algehele passing was goed. Die skattings van die model parameters het egter wel rede tot kommer gegee. Die resultate van die bevestigende faktorontleding dui daarop dat die aanspraak van die ontwikkelaars van die 15FQ+ dat die items wat in elke subskaal ingesluit is spesifieke persoonlikheidsdimensies reflekteer, wel houbaar is. Die grootte-orde van die geskatte modelparameters dui egter daarop dat die items oor die algemeen nie die persoonlikheidsdimensies wat hul ontwerp is om te reflekteer met groot sukses reflekteer nie. Die items is redelik raserige metings van die latente veranderlikes wat hul verteenwoordig. Gebaseer op hierdie bevindinge behoort hierdie instrument met omsigtigheid gebruik te word, veral op groepe wat verskil van die VK steekproewe waarop die instrument ontwikkel en gestandaardiseer is. Die study dra by tot ons begrip van die instrument. Die bevindinge van die studie behoort toekomstige navorsing

op ‘n groter, meer verteenwoordigende steekproef uit dieselfde teikenpopulasie te rig ten einde die onderhawige bevindinge te steun of te weerlê.

ABSTRACT

Organisations in open market economic systems aspire to optimally utilize the scarce resources at their disposal so as to maximize profits. To achieve this goal, the human resources function is tasked with the responsibility to acquire and maintain a competent and motivated workforce in a manner that would add value to the bottom-line. Selection thereby becomes a critical human resources management intervention in any organisation in as far as it regulates human capital movement into and through the organisation. To be able to make informed selection decisions, industrial-organisational psychologists and human resources practitioners need valid and reliable information on predictor constructs to allow them to make accurate predictions of the criterion construct. This provides the essential justification for the primary objective of this study which was to undertake a factor analytic investigation of the first-order factor structure of the Fifteen Factor Questionnaire Plus (15FQ+) on a sample of Black South African managers.

The data used in this study was drawn from the database of Psymetric (Pty) Ltd with the permission of Psytech SA. The sample comprised 241 Black managers assessed by Psymetric (Pty) Ltd between 2002 and 2006. Item- and dimensionality analyses were performed on the 15FQ+ subscales to assess the success with which they represented the underlying personality constructs. The outcome of both the item and dimensionality analyses showed that although the items in each of the subscales seemed to be representing the underlying personality construct, they were not without problems. A spectrum of goodness-of-fit statistics was used to assess the measurement model fit. The model's overall fit was found to be good. The model parameter estimates, however, gave some reason for concern. The results of the confirmatory factor analyses suggest that the claim made by the 15FQ+ authors that the items included in each subscale reflect specific personality dimensions is tenable. The magnitude of the estimated model parameters, however, suggests that the items generally do not reflect the latent personality dimensions they were designated to reflect with a great degree of success. The items are reasonably noisy measures of the latent variables they represent. Based on these findings, this instrument should be used with caution, particularly on groups different from the UK samples on which it was originally developed and standardised. This study expands our understanding of this measure. Its findings should guide future research on a larger, more representative sample from the same target population to give credence to, or to refute these findings.

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CHAPTER 1
INTRODUCTION AND OBJECTIVE OF THE STUDY

1.1. INTRODUCTION

The introductory chapter presents the research objective and presents an explanation as to why the research objective is considered relevant and important for the discipline and practice of Industrial Psychology in South Africa.

Organisations do not constitute natural phenomena but rather man-made entities which exist for a specific purpose. As for organisations in free market economic systems, their primary objective is to maximize profits through the optimal utilization of the scarce resources (which amongst others are human capital) at their disposal at any given time of their lifespan. This orientation consequently drives them to endeavour to shape, influence and control human behaviour (through various human resources management interventions) to be goal- directed to be able to realise their mission and vision objectives.

In order to satisfy the multitude of needs of society, organisations have to combine and transform scarce factors of production into products and services with maximum economic utility. The organisation is thereby confronted with a choice of alternative utilisation possibilities regarding the limited factors of production it has access to. The organisation is guided in this choice by the economic principle, which demands, on behalf of society, that the organisation should attain the highest possible output of need satisfying products and/or services with the lowest possible input of production factors. The organisation (at least in an open market system) aspires to comply with the demand of the economic principle because such compliance enables it to maximise its profits. The motivation for the organisation to serve society through the efficient production of need satisfying products and/or services therefore lies in the opportunity to utilise the capital it has at its disposal, via economic activities directed at the creation of need satisfying products and/or services, for its own benefit. In order to have an optimal exploitation of this opportunity, however, profit maximisation must be designated as the primary organisational goal. The primary objective for the organisation thus is the maximisation of the profit earned over a particular period relative to the capital used to generate that profit (Theron, 1999).

In order to actualise the primary objective of the organisation, a multitude of mutually coordinated activities needs to be performed which can be viewed as a system of inter-related organisational functions. The human resource function represents one of these organisational functions. The human resource function strives to contribute towards organisational objectives through the acquisition and maintenance of a competent and motivated work force, as well as the effective and efficient utilisation of such a work force (Crous, 1986; Theron, 1999). The importance of human resource management flows from the basic premise that organisational success is significantly dependent on the quality of its workforce and the way the workforce is utilised and managed. Labour constitutes a pivotal production factor due to the fact that the organisation is managed, operated and run by people. Labour is the life-giving production factor through which the other factors of production are mobilised and thus represents the factor which determines the effectiveness and efficiency with which the other factors of production are utilised (Marx, 1983; Theron, 1999).

Selection is a critical human resource management intervention in any organisation in as far as it attempts to regulate the movement of employees into and through the organisation with the expectation that this will manifest in improvements in work performance (Theron, 2007). Personnel selection procedures are designed to act as filters that would only choose those employees that will perform optimally on the (multi-dimensional) criterion/performance construct (η). The ideal situation would therefore be if selection decisions could be based directly on information on the criterion construct. In all personnel selection the proverbial horse that the human resource practitioner should be willing to trade his/her kingdom for, is information on the criterion construct. Information on the criterion construct can, however, never be obtained directly at the time of the selection decision since the performance level that will be demonstrated by any applicant will only reveal itself once the applicant has been appointed. The only feasible solution is to (clinically or mechanically) predict/estimate the criterion performance that could be expected from each applicant and to base the selection decision on the expected criterion performance of each applicant. In personnel selection the focus is on the criterion rather than on the predictors from which predictions about the criterion are made (Schmitt, 1989; Theron, 2007). This position is formally acknowledged by the APA sanctioned interpretation of validity and especially predictive validity (Ellis & Blustein, 1991; Landy, 1986; Messick, 1989; SIOP, 2003). This position, moreover, also underlies the generally accepted regression-based interpretations of selection fairness (Cleary, 1968; Einhorn & Bass, 1971; Huysamen, 2002; Theron, 2007). Although the foregoing might seem to be a trivial, inconsequential argument, the criterion-centric nature of personnel selection is actually of critical importance and the failure to appreciate its importance lies at the root of a number of popular misperceptions regarding the use of tests in personnel selection. Specifically it forces one to critically rethink [a] the use of construct referenced norms in personnel selection, [b] the belief that tests are the villains responsible for adverse impact, and [c] the belief that tests can be certified EEA compliant (Theron, 2007).

An accurate (clinical or mechanical) estimate of measures of the criterion construct will be possible from predictor information available at the time of the selection decision to the extent to which [a] the predictor correlates with a (valid and reliable) measure of the criterion and [b] the nature of the predictor-criterion relationship in the appropriate applicant population is accurately understood. Two qualitatively different approaches exist in terms of which predictors can be derived from the conceptualisation of job performance (Binning & Barrett, 1989).

In terms of the *content orientated approach* the job in question would be systematically analysed via one or more of the available job analysis techniques (Gatewood & Feild, 1994) to identify and define the behaviours or competencies (SHL, 2000; 2001) that collectively denote job success if exhibited on the job. Predictor information would then be obtained through low- or high fidelity simulations of the job content or through recall of historical behaviour in positions similar in content to the focal position for which selection occurs. These competency assessments in a selection context necessarily occur away from the job for which selection occurs and prior to the selection decision. Such assessments would reflect competencies that, if exhibited in the focal job after appointment, would denote a specific level of job performance. If competencies are assessed away from the job setting via some form of simulation or via recall of historical behaviour (in contrast to actual on the job performance) the resultant assessments combined can be regarded as a predictor of the criterion.

A *construct orientated approach* to predictor development utilises the conceptualisation of the performance construct (which in itself is multi-faceted and complex in nature and could be difficult to measure) (see Campbell, 1994; Adler, 1996; Wagner, 1997; La Grange & Roodt, 2001) in conjunction with theory and logic to develop, through theorising, a complex performance hypothesis (in the form of a tentative job performance structural model) as a tentative performance theory. In terms of the first option, the job in question would thus also be systematically analysed but now with the purpose of inferring from the description of the job content and context the critical incumbent attributes believed to be determinants of the level of criterion performance that would be attained. If the complex performance hypothesis is valid, it would in principle be possible to estimate job performance as a substitute for actual job performance, provided the nature of the relationship between the performance construct and its person-centred determinants is also known and provided that the predictor constructs could be measured in a construct valid manner at the time of the selection decision.[1]

Personnel selection procedures are thus possible in terms of the construct orientated approach only if [a] they are based on a valid substantive performance hypothesis, [b] the nature of the relationship existing between the performance construct and its person-centred determinants are accurately understood, and [c] person-centred determinants can be measured construct valid at the time of the selection decision (Theron, 2007). The efficiency of such procedures would in turn depend on the extent to which the underlying performance hypothesis reflects the full complexity of the forces shaping job performance (both in terms of the nature of the determinants and the way they combine).

To establish the validity of the performance hypothesis, operational hypotheses are deductively derived from the substantive performance hypothesis by operationally defining the performance construct and the explanatory psychological constructs. The operational definition of the performance construct constitutes a premise in a deductive argument, as do the operational definitions of the explanatory psychological constructs. The validity of the deductive argument depends on the validity of these premises (Copi & Cohen, 1990; Theron, 2002b). In a valid deductive argument the premises provide conclusive grounds for the truth of the conclusion (Copi & Cohen, 1990; Theron, 2002b). The justification for the claim that the operational performance hypotheses constitute valid testable representations of the theoretical performance hypothesis thus depends on the construct validity of the operational measures of the performance construct and the explanatory psychological determinants. Should empirical confirmation for the operational performance hypotheses be found

[1] To investigate the validity of the performance hypothesis and to develop an actuarial prediction rule a critically important additional requirement would be that the criterion construct should be measured in a construct valid manner in the validation study. This theme is further elaborated below.

(assuming that the aforementioned deductive argument was in fact valid), the substantive performance hypothesis may be considered corroborated since it has survived an opportunity to be refuted (Popper, 1972; Theron, 2002a). The validity of the substantive performance hypothesis, in conjunction with evidence on the construct validity of the operational measures of the explanatory psychological constructs, provides justification for the claim that job performance can be inferred and/or estimated from an array of operational predictor measures developed through a construct-related approach (Theron, 2007).

In South Africa a highly relevant question moreover, is whether the assessment techniques used in personnel selection also succeed in measuring the intended predictor constructs as constitutively defined in members of constitutionally protected groups and whether the assessment techniques measure their target constructs in the same manner across protected and non-protected groups.

There exists a definite need in South Africa for psychological measures that meet the standard requirements of validity and reliability and that provide unbiased measures of the target construct across race, gender and cultural groups. A need therefore exists for measures that comply with the Employment Equity Act (Republic of South Africa, 1998) and other relevant legislations for example, Promotion of Equality and Prevention of Unfair Discrimination Act (Republic of South Africa, 2000) and relevant technical guidelines (e.g., Guidelines for the Validation and Use of Assessment Procedures for the Workplace; SIOPSA, 2005) that impose strict principles on the use of psychological measures. The aforementioned hierarchy of controlling bodies and professional board regulations as well as advisory professional society guidelines probably constitute a direct response to the irresponsible usage of psychometrically questionable measures that had negative consequences for the majority of the South African population in the past when most of these measures were imported from overseas and had no local norms (Foxcroft, Roodt & Abrahams, 2001). Only the proper use of psychometrically sound measures would enable practitioners to make informed decisions about individuals' suitability for selection, placement, developmental purposes, promotion, and/ or counselling within organisations. If psychometrically sound measures are used in a responsible manner their utility as selection instruments that provide useful, accurate, and important information about employees would be enhanced and their legality should go unchallenged. The selection procedure would thereby be adding value through the acquisition of the appropriate human capital and that could contribute to competitive advantage.

However, this will be possible only if the construct of interest can be reliably and validly measured across different groups and if the target construct is measured in the same manner across these groups. It however needs to be stressed that evidence on the reliability, construct validity and measurement invariance (Vandenberg & Lance, 2000) of a specific instrument as a measure of a specific construct across different groups constitutes necessary but insufficient evidence to justify the use of the instrument in personnel selection.

Because of the inappropriate usage of psychometrically questionable psychological measures in the past, especially with regards to the assessment of members of now constitutionally protected groups, a need has arisen to use instruments that are scientifically proven to be valid, reliable and unbiased measures of the psychological construct of interest (Theron, 2007). This places pressure on practitioners, but especially test developers and distributors, to generate sophisticated, indisputable scientific evidence that the instruments used in South Africa are psychometrically appropriate for and relevant to the South African context. Consequently, this challenges the Industrial-Organisational Psychology fraternity to demonstrate that the assessment techniques used in personnel selection in South Africa succeed in measuring the intended predictor constructs as constitutively defined across different ethnic groups and that the assessment techniques measure their target constructs in the same manner across different ethnic groups.

The use of measures of personality for selection has oscillated in an out of favour over the years. In a review of 12 years of research published in the *Journal of Applied Psychology and Personnel Psychology* from 1952 to 1963, Guion and Gottier (1965) concluded that personality tests should not be used to inform personnel selection decisions. This position was generally accepted until the publication of the meta-analyses of Barrick and Mount, and Tett, Jackson and Rothstein (cited in Morgeson *et al.*, 2007a) in 1991. Personality is now generally appreciated as an influential causal antecedent of job performance (Borman & Motowidlo, 1997) and especially contextual performance (Borman & Motowidlo, 1993; Van Scotter & Motowidlo, 1996). The interest in personality assessment in personnel selection has in the recent past received renewed research interest (Mount & Barrick, 1995; Ones, Dilchert, Viswesvaran & Judge, 2007; Tett & Christiansen, 2007). The resurgence of research focused on the use of personality variables as predictors in selection research can atleast in part be attributed to the realization that meaningful validation research requires more than indiscriminately relating a multitude of personality dimensions to overall job performance. There are, however, researchers who argue against the over-enthusiastic acceptance of personality as a predictor of performance (Morgeson, Campion, Dipoye, Hollenbeck, Murphy & Schmitt, 2007a; Morgeson *et al.*, 2007b). The central issue of concern to Morgeson *et al.* (2007a; 2007b) is the rather low validity of personality tests for predicting job performance. The meta-analytic studies that lead to a resurgence of interest in personality as a predictor of job performance corrected observed validity coefficients for factors like range restriction, criterion unreliability and predictor reliability. The effect of these factors is, however, typically not controlled when inferring criterion performance from personality assessments.

The call by Morgeson *et al.* (2007a; 2007b) to carefully consider the use of personality measures in personnel selection has merit. However to abandon the use of personality measures would be an overly rash response. The likelihood that personality plays no role in job performance seems small. Practically significant validity coefficients will only be obtained if the manner in which personality affects job performance is more accurately understood. The basic premise should be that job performance is complexly determined (Cilliers, 1998). An approach in which a more manageable limited set of second-order personality factors are hypothesized through theorizing to affect specific job performance dimensions seems to offer an improved likelihood of revealing the intricate logic in terms of which personality affects job performance (Theron, 2007). Moreover, the personality x situation interaction hypothesis proposed by Mischel (2004)[2] seems to have a bearing on this debate

The Fifteen Factor Questionnaire Plus (15FQ+) (Psytech, 2000; 2006) is a prominent personality questionnaire frequently utilized in personnel selection in South Africa[3][4]. The confident utilization of the 15FQ+ in personnel selection in South Africa requires [a] that a convincing argument be developed as to why and how personality (as interpreted by the15FQ+) should be related to job performance, [b] that a structural model derived from the

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[2] Mischel's (2004) attempt to reconcile the invariance of personality with behavioural variability will be discussed briefly in paragraph 2.2..

[3] The15FQ+ would typically not be used in isolation, but rather would form part of a larger selection battery measuring a variety of person characteristics hypothesized to be determinants of work performance.

[4] It should explicitly be conceded that the 15FQ+ is also frequently used for purposes other than selection, which amongst others include, but are not limited to, career guidance, career development, coaching, counselling. This study chose to justify the research objective in terms of the use of the instrument in selection. The research objective could, however, also have been motivated from the perspective of any of the other uses of the instrument.

foregoing argument fits empirical data (i.e., there is support for the performance hypothesis), [c] that evidence be available that the predictor and criterion constructs are validly and reliably measured in the various sub-groups typically comprising applicant groups in South Africa and [d] that evidence be available that [at least] race and gender group membership do not systematically affect the manner in which the predictor and criterion constructs express themselves in observed measures. The objective of this research is to contribute to the available psychometric evidence with regards to the third aspect mentioned above. The confident utilization of the 15FQ+ in specific personnel selection procedures aimed at filling vacancies in specific positions in specific organisations would, however, in addition to the above also require credible evidence on the predictive validity, fairness and utility (Guion, 1998) of the selection procedure.

1.2 OBJECTIVES OF THE STUDY

In the development of a performance hypothesis, specific connotative meaning is attached to each of the latent variables comprising the hypothesis and these are expressed in specific constitutive definitions (Theron, 2002a). The connotative meaning of the latent variables are therefore set during the theorizing phase of the research since the manner in which a construct is used in an argument cannot be divorced from the meaning afforded to the construct. The connotative meaning of constructs firstly arises from the internal structure of the construct (i.e., the number and nature of the dimensions comprising the construct and the manner in which the constitutive definition defines the dimensions to be related). The connotative meaning moreover arises from the manner in which the construct is embedded in a larger nomological network of latent variables (i.e., seen to be directly influenced by specific latent variables, understood to directly influence other latent variables but defined to be only indirectly related to still other latent variables). The manner in which the construct of interest is embedded in the larger nomological network is revealed in the manner in which the construct is used in constructing explanations (in language, essentially) (Theron, 2002a).

The 15FQ+ is based on a specific interpretation of personality. The architecture of the instrument reflects a specific design intention. The structural design of the 15FQ+ reflects the intention to construct sixteen essentially[5] one-dimensional sets of twelve items each to reflect variance in each of the sixteen latent personality dimensions collectively comprising the personality construct. The 15FQ+ items are meant to function as stimuli to which testees respond with behaviour that is primarily a relatively uncontaminated expression of a specific underlying latent personality dimension. Specific items were chosen for a specific subscale because of the belief that they reflect (and consequently correlate with) that specific first-order personality dimension. It is thereby firstly not implied that the first-order personality dimensions are narrowly defined, very specific constructs. Instead, the personality traits measured by the 15FQ+ are interpreted as broad personality dimensions. The development of the 15FQ+ is based on the factor analytic perspective of Cattell (Cattell, Eber, Tatsuoka, 1970). Cattell favoured an approach to subscale construction in which each item is earmarked to primarily represent a specific personality dimension. At the same time however, each item to a lesser degree also reflects all of the remaining personality dimensions comprising the personality domain with a pattern of small positive and negative loadings (Gerbing & Tuley, 1991). It is not possible to isolate behavioural indicators that are pure reflections of only a single personality dimension. Although the behavioural indicators placed in a specific subscale would primarily reflect the personality dimension measured by that subscale, the behavioural indicators would also be (positively and negatively) influenced by all the remaining personality factors, albeit to a lesser degree. When computing a subscale total score the positive and negative loading patterns on the remaining factors cancel each other out in what Cattell referred to as a *suppressor action* (Cattell, Eber, Tatsuoka, 1970; Gerbing & Tuley, 1991). To the extent that the personality dimensions measured by the 15FQ+ are broader constructs one would expect individual item indicators of each first-order personality dimension to load lower on a single factor. Moreover, in terms of the Cattellian approach to subscale construction the subscale items would also be expected to correlate lower amongst themselves.

The scoring key of the 15FQ+ nonetheless still reflects the expectation that all items comprising a specific subscale should load on a single dominant factor. It is because of this assumption that these items can be used to derive an observed score for that specific personality dimension (and only that dimension). When calculating a subscale score for a

[5] The term ‘essentially uni-dimensional’ refers to the situation in which the items in a subscale all reflect a single underlying latent variable but display a random pattern of positive and negative loadings on the 15 remaining personality dimensions.

specific personality dimension, only the items comprising that specific subscale are combined. It is thereby not implied that the sixteen first-order personality dimensions do not to a certain degree share variance. The $15FQ^{+}$ assumes the first-order personality dimensions are correlated and that the correlation can be explained in terms of a limited set of second-order factors (Psytech, 2006). A specific (first-order) measurement model is thereby implied in which each specific latent personality dimension comprising the $15FQ^{+}$ interpretation of personality reflects itself primarily in the specific items written for the specific sub-scale. The basic first-order measurement model could, moreover, be expanded into a second-order measurement model also reflecting the manner in which second-order personality factors express themselves in first-order personality dimensions.

The objective of the study is to evaluate the fit of the (first-order) $15FQ^{+}$ measurement model on a sample of two hundred and forty-one Black South African managers. The fit of the second-order $15FQ^{+}$ measurement model is not evaluated.

1.3 STRUCTURE OF THE THESIS

The history of the development of the 15FQ+ will be chronicled in Chapter 2. This chapter will also present the definition of personality underlying the 15FQ+. Available international and South African psychometric evidence on the reliability and validity of the 15FQ+ as a measure of personality (given its specific constitutive definition) will also be reviewed. In Chapter 3 the methodology used to evaluate the 15FQ+ measurement model fit will be described. Chapter 4 will present the research results and Chapter 5 will present the conclusions and implications for future research.

CHAPTER 2
AN OVERVIEW OF THE 15FQ+ AS A MEASURE OF PERSONALITY

2.2 INTRODUCTION

This section of the thesis will delineate the process followed by the developers of the 15FQ+ in the construction of this personality measure. The introductory section pointed out the need for a close scrutiny of the 15FQ+ as a measure of personality widely used in South African industrial and organisational settings. The intention is to do this through a factor analytic investigation into the first-order factor structure of the instrument within a Black professional group. The primary objective of the research is to undertake a confirmatory factor analysis to determine whether all items in the test reflect the latent personality dimensions they were (according to the scoring key) designed to reflect in the group being studied. The fundamental purpose of the research is to affirm or discount the use of this measure for the assessment of personality in Black South African managers. Should the measurement model implied by the manner in which the 15FQ+ interprets personality, in conjunction with the architecture of the questionnaire, fit the data obtained from a sample of Black South African managers, it would, however, still constitute insufficient evidence to conclude that the use of the instrument in a multi-cultural setting would not be problematic. The fact that the 15FQ+ measurement model would fit data from white and Black South African managers would still beg the question whether the measurement model parameters are the same across the two groups. If the measurement model parameters would not be the same, despite the fact that the model fits the data from both managerial groups, the interpretation of the observed scores across White and Black South African managers will remain problematic. A necessary first question is, however, whether the measurement model underlying the 15FQ+ fits the data of White and Black South African managers in separate, independent analyses. This study will focus only on the question whether the first-order measurement model underlying the 15FQ+ fits the data of Black South African managers. A subsequent study will have to investigate the question whether the first-order measurement model underlying the 15FQ+ fits the data of Black South African managers.

Chapter 2 will clarify the purpose for which the 15FQ+ was developed, delineate the processes followed in the construction of the 15FQ+, explain the manner in which it conceptualized personality and evaluate the success with which it measured this personality construct. In short, Chapter 2 will present an overview of the history, structure, validity and reliability of the 15FQ+. Chapter 2 will also attempt to show that reasonable empirical evidence exists to argue that the 15FQ+ reliably and validly measures personality as defined amongst white (South African) managers, but that similar evidence with regards to Black South African managers is lacking.

2.2 CONSTITUTIVE DEFINITION OF PERSONALITY UNDERLYING THE 15FQ+

The term 'personality' is derived from the Latin word *persona* meaning *"mask"***,** referring to the mask that people wear in dealing with others as they play various roles in life. Viewed in this manner personality thus refers to the behavioural trend/tendency displayed by individuals in response to the demands of social conventions and traditions and in response to their inner archetypal needs (Hall & Lindzey, 1957). Judging from Hall and Lindzey's (1957) view, the term 'personality' could be interpreted as the characterization of the individual as an object of external evaluation. In general terms John and Srivastava (1999) view personality as referring to a set of more or less stable characteristics, as assessed and judged by others that distinguish one individual from another. These characteristics are assumed to hold across time and place and to underlie behaviour. This assumption has however been difficult to prove empirically (Mischel, 2004). The classical assumption is that personality traits are expressed directly in behaviour and therefore it is assumed that a specific standing on a latent personality dimension should result in consistent behaviours across many different situations. Situational characteristics might exert a causal influence on behaviour as well but they do so independent of personal characteristics (and then specifically stable personality traits). A conscientious individual is expected to behave conscientiously consistently in all situations and an individual high on the agreeableness dimension should act agreeably across a wide variety of situations. The typical finding, however, is that "the individual's behaviour and rank order position on virtually any psychological dimension tends to vary considerably across diverse situations, typically yielding low correlations" (Mischel, 2004, p. 2).

One way of accounting for the variability in behaviour across contexts is to argue that it reflects the influence of extraneous variables and measurement error (Mischel, 2004). In terms of this line of reasoning the nature of the situation represents one of these extraneous variables and therefore needs to be controlled as a nuisance variable if the role of personality in behaviour is to be clearly understood. An alternative way of accounting for the variability in behaviour across situations is to not regard the situation as a nuisance variable that creates noise, but rather to treat it as a necessary and integral component of personality theory. The interaction between personality and situational characteristics are, in terms of this approach, seen to hold the clue to understanding and predicting behavioural variability across situations. More specifically, it is not the objective situation that is seen to be important, but rather the individual's subjective interpretation of the situation. Behavioural consistency would therefore only be expected across situations if the situations are appraised similarly. More complex *if … then* situation-behaviour relationships are therefore expected to exist in terms of this line of reasoning (Mischel, 2004).

Mischel's (2004) argument need not mean that the construct of personality, as it is typically defined, is obsolete and redundant. The traditional position on the relationship between (stable) personality traits and behaviour should, however, in terms of his argument be discarded as oversimplified. Mischel's (2004) argument rather points to the necessity of incorporating personality in richly interconnected explanatory structural models that also reflect salient psychological characteristics of the situation as well as other personal characteristics that affect the manner in which the situation is interpreted.

Given the complexities of defining personality, there is a large array of definitions. Below some definitions of the concept are reviewed that succinctly capture the essence of the personality construct as viewed by various researchers.

Cattell (1950) defines personality as:

> that which permits a prediction of what a person will do in a given situation. Personality is concerned with all the behaviour of the individual, both overt and under the skin (Cattell, 1950, pp. 2-3)

Carver and Scheier (2000) define personality as:

> a dynamic organisation, inside the person of psychophysical systems that create a person's characteristic patterns of behaviour, thoughts and feelings. This definition views personality as involving ongoing readjustments, adaptations to experience, continual upgrading and maintenance of personality driven from within the person to distinctively define a person. The latter suggests internal storage of patterns, supporting the notion that personality influences behaviour etc. (Carver & Scheier, 2000, p. 5)

Ryckman (1997, p.5), defines personality as:

> the dynamic and organized set of characteristics of a person that uniquely influences his/her cognitions, motivations, and behaviours.

This definition points to the intrinsic organisation of an individual's psychological makeup that is stable over time and consistent over situations and has an inherent lawfulness to it in that it directs individuals to follow certain career and social orientations in life.

Allport (1961) describes personality as:

> the organization within the individual of those psychophysical systems that determine his/ her characteristic behaviour and thought. This description ascents to the interaction of physical and psychological characteristics and emphasizes that these inner determinants of behaviour leads to generalized modes of behavioural outcomes and determine his/ her unique adjustments to his or her environment. (Allport,1961, p. 28)

Phares and Chaplin (undated) describe personality as:

> a continuous dimension that can be defined as a broad, stable and enduring characteristic used to explain behaviour. (Phares & Chaplin, undated)

Byrne (1974) provides the following definition:

> The culmination of all relatively enduring dimensions of individual differences on which he (an individual) can be measured (Byrne, 1974, p. 26);

Mischel (1976) defines personality as:

> The distinctive pattern of behaviour (including thoughts and emotions) that characterize each individual's adaptation to the situations of his or her life (Mischel, 1976, p. 12);

Sullivan (1953) provides the following definition:

> A relatively enduring pattern of interpersonal situations that characterize a human life (Sullivan, 1953, p. 111);

From the foregoing definitions, it is clear that personality is an abstract construct created by theorists to explain behaviour. Regardless of when they were coined, or the theoretical approach theorists adopt, all the foregoing definitions point to two keys issues, namely, [a] the consistency and continuity of an individual's behaviour (as defined by the repeated use of words like 'enduring' and 'characteristic') from one situation to the next and [b] the differences in behaviour of individuals (distinctiveness of a person's characteristics) when confronted with the same situation. In essence, these definitions view personality as an influential explanatory construct that explains why the behaviour of individuals differs in essentially the same situation. These definitions introduce personality as a dynamic organisation that from birth is ceaselessly engaged in transformative functional operations.

Although there are similarities and even sometimes near consensus in the above definitions, the crux of the matter as argued by Lanyon and Goodstein (1971) is on defining what the antecedents of these enduring characteristics are, the extent to which they are inherited, learned in early childhood, or developed in later life, and the conditions under which, and the extent to which, they are expected to change. These scholars believe that it is around such questions that major differences in personality theories are found which as a result has led to the mushrooming of a variety of personality theories and personality scales.

Personality has been conceptualized from a variety of theoretical perspectives characterized by various levels of abstraction or breadth (John, Hampson, & Goldberg, 1991; McAdams, 1995). Each one of these levels has in one way or another made a unique contribution to our understanding of individual differences in behaviour and experience. Hall and Lindzey (1957, p. 167**)** view this as possibly emanating from "the particular empirical concepts which are part of the theory of personality employed by the observer." The various schools of thought about this concept have led to a bewildering array of personality scales with the same name but often measuring different concepts that are not the same and sometimes scales with different names measuring concepts that are similar. John and Srivastava (1999) contend that this has left researchers and practitioners in the field of personality assessment, faced with a bewildering choice of scales, with little guidance and no overall rationale at hand. This view is echoed by Staub (1980) who also alludes to the existence of many theories that attempt to define and explain personality. Staub also comments on the difficulty of precisely defining the term 'personality' as a hypothetical construct that can never be directly observed but only inferred from behaviour. The fact that the term 'personality' can be dealt with from different vantage points indicates that personality psychology has not yet reached definitional consensus around this concept despite the wide ranging research that has been done in this field.

This lack of consensus on the concept highlights the challenges faced by researchers and practitioners alike in coming up with a common language able to unequivocally identify the key elements that comprise personality. The non-existence of a common understanding of what personality is and how it could be measured has led to a plethora of definitions and measures within the field of personality psychology. However, regardless of these diverse views about personality, Eaves (1989) indicates that most theorists agree that in order to perform a systematic exploration of personality's relation to other variables, a definite set of personality factors needs to be specified. This understanding has provided a common ground for theorists and practitioners to study, communicate and utilize personality as a decision-making tool in both the educational and clinical settings. In furtherance of a similar view, Gatchel and Mears (1982), believe that in spite of the differences in their terminology and approach, most theorists agree that personality is an internal, mental and emotional pattern of response to the environment, a pattern of thought, feelings and behaviour that affects every aspect of a person's life within and outside organisational settings.

In pursuance of this view, Rothstein and Goffin (2000) cite some form of agreement among researchers and practitioners in Industrial/Organisational Psychology that certain personality attributes can contribute to the prediction of relevant job performance criteria and therefore may be useful in personnel selection. This sentiment is echoed by Abraham and Morrison (2003), Barrick, Mount and Judge (2001), Hurtz and Donovan (2000) and Salgado (1998; 2003). Morgeson *et al.* (2007a; 2007b), Hogan (1991) and Hogan and Shelton (1998) question the use of personality as a predictor in personnel selection. Moreover, there is no consensus amongst researchers about the exact nature of the personality-job performance relationship (Rothstein & Goffin, 2000). Nonetheless, the understanding of personality theory is of prime importance to researchers and practitioners in seeking to understand individuals' temperament and their suitability for a role or work-related activities in specific fields and their propensity to respond in certain ways in different occupational settings or environments. Hampson (1982) contends that, in a way, they all concur that personality explains behavioural consistency as it is assumed to be a major determinant of behaviour and, since it remains relatively stable, the behaviour it determines will be consistent too. In furtherance of this view, Staub (1980) argues that jointly these definitions provide a picture of what personality psychologists regard as central to the conception of personality. The above definitions reflect the initial conception of personality propounded by Cattell in 1946, who viewed personality as comprising of basic structural elements that could be measured to determine individuals' temperament or behavioral disposition for proper placement or sound decision-making processes.

It should be noted that although some of these definitions were propounded many years ago they still hold even in the present times and some of them still draw their meaning from the works of scholars like Allport, Cattell and others who did commendable research in personality psychology.

In the next section, some of the schools of thought or theories that emerged from different vantage points to try and explain personality are discussed.

2.2.1 PSYCHODYNAMIC THEORY

Psychoanalytic theory was originally postulated by Sigmund Freud (Pervin, Cervone & John, 2005). This theory is based on the notion that personality is described in terms of three interdependent psychological forces, which Bennett and Kassarjian (1972) describe as the *id*, which is the brutish unrestrained pleasure-seeking impulses that demand instant gratification, the *ego* which constrains and guides the urges of the *id* by providing structure to conform to social reality, and the *super-ego* (which is the seat of an individual's moral ideas of right and wrong) which work collectively or come into conflict to shape personality. For Hogan (1976), this theory emphasizes unconscious motivations and the conflicts between primal urges and learned social mores as determinants of personality and behaviour. It stresses the importance of early childhood experiences as determining mature personality.

2.2.2 BEHAVIORISM

This theory was postulated by scholars like Pavlov, Watson and Skinner (Pervin, Cervone & John, 2005). This school of thought views personality as a function of learned responses to external stimuli. As a result, the behaviouristic position is that the characteristic behaviour patterns normally ascribed to personality is actually simply a learned response to environmental stimuli and would therefore change significantly with a shift to a new environment. The behaviouristic position in effect makes it unnecessary to assume a personality construct to explain variance in human behaviour (Pervin, Cervone & John, 2005).

2.2.3 SOCIAL LEARNING THEORY

This theory is based on the works of Albert Bandura (1977) and Walter Mischel (1971). Like Behaviorism, this theory recognizes the importance of environmental influences working in conjunction with forces such as memory, cognitive capabilities and feelings to determine personality. This school of thought further assumes that most new behaviour is learnt through observational learning and that the newly learned behaviour serves a specific purpose. In this regard, Ryckman (1997) indicates that individuals are guided by motives to attain certain goals. Like the trait perspective, this theory assumes that personality refers to the regularity and consistencies in the behaviour of individuals (Snyder & Ickes, 1985).

2.2.4 PHENOMENOLOGICAL-EXISTENTIAL-HUMANISTIC APPROACH

The phenomenological-existential-humanistic approach stresses the uniqueness of each individual, people's basic goodness and the inherent striving towards self-actualisation (Pervin *et al.*, 2005).

2.2.5 BIOLOGICAL APPROACHES

These approaches focus on the role of specific genes, the brain, neurotransmitters and evolution as determinants of personality (Previn *et al.*, 2005). The stance that biological factors play a significant role in personality has always tended to be somewhat controversial (Previn *et al.*, 2005). It seems unlikely, however, that environmental factors would be the sole determinant of differences in personality. Biological factors probably do play a fundamental role in the manner in which personality differences develop. An approach that acknowledges the integrated role of environmental as well as biological determinants, however, seems to be called for. As a case in point, Eysenck (1970; 1990) attempted to isolate the biological underpinning of the three second-order personality traits he proposed as the major building blocks of personality.

2.2.6 TRAIT THEORY

This is the theory that most personality assessment instruments, including the 15FQ+, are based on. The theory presupposes that individuals possess various traits or dispositions that make them respond in a consistent way across situations. Carver and Scheier (2000) mention that the trait theory assumes that people differ on variables or dimensions that are continuous. The trait theory enables researchers and practitioners to identify and explain individual differences in behaviour within and outside organisational settings.

This theory was first postulated by Allport around 1937. Allport (1937, p. 292) defines a trait as "a neuron-psychic structure having the capacity to render many stimuli functionally equivalent, and to initiate and guide equivalent (meaningfully consistent) forms of adaptive and expressive behaviour." In essence this perspective assumes that there are "dispositional factors that regularly and persistently determine conduct in a variety of everyday situations" (Furnham, 1990, p. 928). These lasting, broad dispositions result in a consistent likelihood of behaving, feeling and thinking in a specific manner, across many situations (Pervin *et al.*, 2005). Personality traits nonetheless do not express themselves in all situations in the same manner, irrespective of the nature of the situation. The behaviour, feelings and thoughts of the same individual will to some degree vary across situations as a function of the perceived demands posed by the situation. Despite these situational differences, personality traits nonetheless still express themselves in a generalized behavioural tendency across time and situations (Pervin *et al.*, 2005). Personality traits are distinguished from more transient and externally determined states (Pervin *et al.*, 2005).

There is a danger that the trait theory's stance that personality traits are broad dispositions to behave in a consistent manner could be misinterpreted. Personality traits are latent variables or (descriptive) constructs inductively inferred from specific observable behaviours sharing a common theme. The latent variable is in essence the abstract theme common to a bundle of specific observable behaviours. As such, latent variables allow man to create intellectual order out of what would otherwise have been a sensory cacophony. At the same time, however, this now creates the danger that trait personality theory could be inappropriately used to create nonsensical circular and illusionary causal explanations (Pervin *et al.*, 2005). Traits inferred from behaviour cannot be used to causally explain the same behaviour it was inferred from. Traits inferred from behaviour can, however, be used to causally explain conceptually independent/distinct behavioural constructs.

Personality traits and the behaviour that they underlie can be ordered in a hierarchical structure. Groups of specific behavioural responses combine into behavioural habits. Groups of behavioural habits combine into (first-order) personality traits. Specific groups of first-order personality traits in turn combine in a more limited number of second-order factors (Eysenck, 1970; 1990; Pervin *et al.*, 2005). The thrust of this theory is therefore to determine and describe the additive combination of key attributes (traits) of personality (which Cattell called 'building blocks') that help in describing individuals in terms of these traits and to examine their association with behaviour so as to understand how these traits compel an individual to respond in a certain way in a given situation.

Allport (1937) distinguished between cardinal traits, central traits and secondary traits. Cardinal traits constitute dominant, pervasive dispositions that affect almost all behaviours. Central traits constitute dispositions with a more selective but still influential effect on behaviours in specific situations. Secondary traits are more subtle, less conspicuous dispositions that express themselves in a few select situations (Pervin *et al.*, 2005). Cattell (1943) distinguished three major categories of dispositions that capture the essence of personality, namely ability traits, temperament traits and dynamic traits.

> Ability traits relate to skills and abilities that allow the individual to function effectively. … Temperament traits relate to the emotional life of the person and the stylistic quality of behaviour: whether one tends to work quickly or slowly, be generally calm or emotional, or act after deliberation or impulsively, all have to do with qualities of temperament that vary from individual to individual. Dynamic traits relate to the striving, motivational life of the individual, the kinds of goals that are important to the person. (Pervin *et al.*, 2005, p. 243)

Whether skills and abilities should be interpreted as conceptually being part of personality seems questionable. Cattell, moreover, distinguished between surface traits and source traits (Cattell, Eber, & Tatsuoka, 1970). The term surface trait is actually a bit of a misnomer since it does not really refer to a trait in the true sense of the term although on a superficial level it may appear as if there is co-variance in a bundle of behaviours with a common theme. Source traits on the other hand constitute the true building blocks of personality (Pervin *et al.*, 2005) in that they represent the common abstract theme in a bundle of behaviours that account for the co-variance observed in the behaviours.

Although Allport significantly contributed to the development of the trait theory of personality, he did not to any significant degree focus on the identification of specific traits (Pervin *et al.*, 2005). Eysenck (1970; 1990) on the other hand significantly contributed towards the development of a specific nomothetic trait model of personality. Eysenck (1970; 1990) initially distinguished between two independent second-order personality factors, namely [a] introversion-extroversion and [b] neuroticism. Eysenck later added a third second-order personality factor, psychoticism, to complete his Psychoticism-Extraversion-Neuroticism (PEN) three-factor theory of personality (Pervin *et al.*, 2005). Cattell (1965; 1979; 1990) shared Eysenck's conviction that personality could be fruitfully described in terms of a limited number of traits but differed from Eysenck in as far as he felt that a fruitful trait theory of personality would have to make provision for [a] a larger number of traits, and [b] operate on a lower level of aggregation (Pervin *et al.*, 2005).

The development of the 15FQ+ is founded on the work of Cattell (1943; 1965; 1979; 1990). Cattell's primary aim was originally to obtain a parsimonious scientific taxonomy of personality traits within which the large numbers of particular attributes that make human beings individual and unique could be understood in a simplified manner. To derive the taxonomy, Cattell (1943; 1965; 1979; 1990) used three sources of data, namely questionnaire data (Q-data), life record data (L-data) and objective test data (OT-data). As in the research of Eysenck (1970; 1990), exploratory factor analysis played a pivotal role in Cattell's attempts to isolate the fundamental building blocks of personality from these three types of data (Pervin *et al.*, 2005). Cattell (1965, 1979) moreover argued that for any factor analytically derived trait structure to achieve credibility, essentially the same structure had to emerge from all three types of data.

Cattell used the Allport and Odbert list of trait terms (which provided the initial structure for the personality lexicon) (John & Srivastava, 1999) as a basis to obtain a multidimensional personality structure. He did this by collapsing a set of 4500 trait terms to a mere 35 variables (John, 1990; John & Srivastava, 1999) through semantic and empirical clustering procedures complimented by his (Cattell's) views of the personological studies of the time. John and Srivastava (1999) view this drastic reduction of the extensive list of terms tenaciously defended by Allport (1937) as having been dictated primarily by the data-analytic limitations of his time which made factor analyses of large variables sets prohibitively costly and complex. In a bid to undertake his taxonomic research, Cattell used the smaller set of variables to identify the basic building blocks of personality which should provide a systematic framework (taxonomy) for distinguishing, ordering, and naming individual differences in people's behaviour and experience, through several oblique factor analyses (Cattell, Eber & Tatsuoka, 1970). Through the latter factor analytic method, Cattell isolated 12 personality factors which eventually became part of his 16 Personality Factor (16PF) questionnaire (Cattell, Eber & Tatsuoka, 1970). The successful measurement of these dimensions was meant to help in predicting complex behavioural criteria (e.g., leadership, self-esteem, creativity etc) and understanding the intra-psychic characteristics and tendencies that would enable practitioners to influence human behaviour.

In the case of the 15FQ+, the definition of personality is based on the views of the founder of its predecessor - the 16PF (Cattell, Eber & Tatsuoka, 1970). The latter viewed personality as based on basic structural elements just like the physical world which has basic building blocks. The definition that underlies this measurement is that postulated by Allport in 1937 which was then adopted by Cattell (1946) in a bid to get a simplified typology of understanding the intra-psychic characteristics and tendencies that define individuals. As such, Cattell did not base his definition of personality on clinical disposition like other theorists that refer to changing or modifying behaviour from undesirable to desirable or from abnormal to normal.

2.3 OVERVIEW OF THE DEVELOPMENT OF THE 16PF

This measure was developed by Cattell and was first published in 1949. Like Allport, Cattell used the lexical approach premised on the notion that the more important a word is in any language, the more often it will appear. Carver and Scheier (2000) indicate that Cattell (1943) was of the view that within each language there are words that describe everyday behaviour and its known qualities. In this regard, these scholars further mention that Cattell believed that the importance of a trait is reflected in the number of words that describe it within the ambit of any language. On the basis of the data collected and extensive factor analyses (of self-reports, inventories, biographical or life data, and behavioural observations), Cattell (1965) identified 16 factors which he regarded as the "source traits" of the normal personality structure suitable for measuring by means of a self-report inventory. He based this argument on the belief that source traits are stable and determine an individual's consistent behaviour and direct differences in surface traits. As a result, Ryckman (2000) thinks that Cattell believed that behaviour could be predicted more accurately once the major source traits (primary traits) of an individual had been identified. The identified sixteen primary traits were given high or low ratings depending on the individual being tested. Table 2.1 below summarizes the source traits (primary scales) in terms of their behavioural denotations at the high and low end of each latent continuum.

TABLE 2.1

CATTELL'S 16 FIRST-ORDER PERSONALITY FACTORS MEASURED BY THE 16PF

Description of low range	Primary scale	Description of high rage
Reserved, impersonal, distant	Warmth (A)	Warm, participating, attentive to others
Concrete, low mental capacity	Reasoning (B)	Abstract, bright, fast learner
Reactive, affected by feelings	Emotional Stability (C)	Emotionally stable, adaptive, mature
Deferential, cooperative, avoids conflict	Dominance (E)	Dominant, forceful, assertive
Serious, restrained, careful	Liveliness (F)	Enthusiastic, animated, spontaneous
Expedient, nonconforming	Rule-Consciousness (G)	Rule conscious, dutiful
Shy, timid, threat sensitive	Social Boldness (H)	Socially bold, venturesome, thick skinned
Tough, objective, unsentimental	Sensitivity (I)	Sensitive, aesthetic, tender-minded
Trusting, unsuspecting, accepting	Vigilance (L)	Vigilant, suspicious, sceptical, wary
Practical, grounded, down to earth	Abstractedness (M)	Abstractedness, imaginative, idea oriented
Forthright, genuine, artless	Privateness (N)	Private, discreet, non-disclosing
Self-assured, unworried, complacent	Apprehension (O)	Apprehensive, self-doubting, worried
Traditional, attached to familiar	Openness to Change (Q_1)	Open to change, experimenting
Group oriented, affiliative	Self-reliance (Q_2)	Self- reliant, solitary, individualistic
Tolerates disorder, unexacting, flexible	Perfectionism (Q_3)	Perfectionist, organized, self disciplined
Relaxed, placid, patient	Tension (Q_4)	Tense, high energy, driven

Adapted from Conn & Rieke, (1994). 16PF Fifth Edition technical manual, Champaign, IL: Institute for Personality and Ability, Inc.

The result of this process was the development of the 16PF test, which is a self-descriptive questionnaire which measures the normal range of personality. The instrument was originally available in three forms. Forms A and B each contained 187 items and the shorter form C comprised 105 items, all yielding scores on the 16 source traits which Cattell considers to comprise the natural unitary structure of personality, logically equivalent to atomic elements in the physical world. This meant that, like Allport, Cattell's study was more concerned with traits that were expressions of individuality and uniqueness which he too, referred to as individual traits or personal dispositions. Frick (1991) views this viewpoint as not negating the pervasiveness of common traits exhibited by most people in a given culture. The goal of the test is to document the individuals' characteristics and match them to appropriate roles within any given setting.

The 16PF model is hierarchical. When the sixteen primary traits were themselves factor-analyzed, they revealed five global or second-order factors which describe personality at a higher level of aggregation. These global factors are:

- Extraversion
- Anxiety
- Tough-mindedness
- Independence
- Self-Control

Specific correlations exist between the first-order personality factors. As argued by *Overview: History and Development of the 16PF* (2003), these five global factors help to explain the relationships observed among the source primary scales. The correlations existing between the 16 first-order personality factors can be explained in terms of the 5 second-order personality factors. Table 2.2 below presents brief descriptions of high and low scores on the five second-order factors and the manner in which the 16 first-order factors load on the five global factors.

These second-order factors represent common themes shared by specific first-order latent personality variables that are responsible for producing the correlations between the first-order personality factors (Bollen, 1989). Second-order factors thus necessarily are broader and more general constructs. Second-order factors do not, however, explain all the variance in the more specific first-order factors. There is systematic variance, unique to the more specific first-order factors that are not related to the more general second-order factors (Hull, Tedlie & Lehn, 1995).

TABLE 2.2

16PF GLOBAL FACTORS

Global Factors	Low	High	First-order factors loading on second-order factor
Extraversion	Introverted, socially inhibited	Extraverted, social participant	Warmth (A+), Liveliness(F+),Social Boldness (H+),Privateness (N-), Self-reliance(Q2-)
Anxiety	Low anxiety, relaxed, imperturbable, well-adjusted	High anxiety, tense, perturbable, histrionic	Emotional Stability(C-), Vigilance(L+),Appreciation(O+), Tension(Q4+)
Tough-Mindedness/Willpower	Receptive, open-minded, intuitive, emotionality, feeling	Tough-minded, resolute, non-empathic, determined	Warmth(A-),Sensitivity(I-), Abstractedness(M),Openness to Change(Q1+)
Independence	Accommodating, agreeable, selfless, subdued	Independence, persuasive, wilful	Dominance(E+), Social Boldness (H+), Vigilante(L+),Openness to Change(Q1+)
Self-Control	Unrestrained, impulsive, uncontrolled	Self-controlled, inhibitory of impulses	Liveliness(F-),Rule-Consciousness(G+),Abstractedness(M-), Perfectionist(Q3-)

Note: The "+" and "-" signs indicate the relationship of the Primary Factor to the Global Factor. For example, factor Abstractedness (M) is inversely related to Self-Control (SC). (16PF® Fifth Edition Personal Career Development Profile Technical and Interpretative Manual, 1995; 2000)

The global factors of the 16PF are closely related to the 'Big Five' dimensions of personality (Costa & McCrae, 1992) as they are both derived via the lexical tradition (which in turn can be traced indirectly to Allport and Odbert's (1936) list of English-language trait names and Digman and Goldberg's work). The Big Five were discovered through factor analyses of Cattell's model and these have since made a monumental contribution to our understanding of the role of personality in human behaviour. Because of their origin, which is based on the fundamental principles and goals of Cattell's 16 Personality Factor Model, these Big Five dimensions are not very different from Cattell's global or second-order factors as shown in Table 2.3 below (Pervin & John, 1999). Inspection of Table 2.3 indicates that the second-order factors of the 16PF correspond closely with the Big Five identified by Costa and McCrae (1985; 1989; 1992; 1995) which reinforces the argument that the latter factors are firmly entrenched in the lexical tradition of personality structure research which was the basis for the development of the 16PF and the brainchild of Cattell.

TABLE 2.3

BIG FIVE FACTORS AND 16PF EQUIVALENT

Big Five Factor (16PF equivalent indicated in brackets)	**Describes**
Neuroticism (Anxiety)	Anxiety Angry Hostility Depression Self-Consciousness Impulsiveness Vulnerability
Extraversion (Extraversion)	Warmth Gregariousness Assertiveness Activity Excitement-Seeking Positive Emotions
Openness (Tough-minded)	Fantasy Aesthetics Feelings Actions Ideas Values
Agreeableness (Independence)	Trust Straightforwardness Altruism Compliance Modesty Tender-mindedness
Conscientiousness (Self-control)	Competence Order Dutifulness Achievement Striving Self-Discipline Deliberation

2.4 HISTORY OF THE 15FQ+

The 15FQ+ is a normative, trichotomous factor-based measure of occupational personality, developed as an update of the much-used 15FQ which was first published in 1991 by Psytech International. The latter measure (15FQ) was developed as an alternative to the 16PF series of tests measuring the normal personality structure that was first identified by Cattell and his colleagues in 1946 (Meiring,Van de Vijver, & Rothmann, 2006; Tyler, 2003). Both versions of the test (15FQ and 15FQ+) were designed for use in industrial and organisational settings. According to Tyler (2003), the original version of the 15FQ was developed to assess 15 of the 16 personality dimensions that were first identified by Cattell and his colleagues in 1946. For practical reasons the 15FQ excluded Factor B of the 16PF which is a measure of reasoning ability or intelligence. The reason for this was the understanding that intelligence cannot be measured by untimed personality tests as was the case with Cattell's Factor B in the 16PF test series. However, in the 15FQ+, its authors reconstructed Factor B as a meta-cognitive personality variable known as 'intellectance' as opposed to an ability factor. The re-interpretation of Factor B as a personality trait warranted its inclusion in an un-timed personality questionnaire. This means that Factor B does not assess intelligence *per se* but as Tyler (2003, p. 7) puts it, "a person's confidence in their intellectual ability, defined in the 15FQ+ manual as: "…a self reported superior level of intellectual capacity, a preference for, and enjoyment of, complex arguments and ideas, a self-reported superior level of: verbal ability, abstract reasoning ability and numerical ability".

Since its inception, the 15FQ+ has been widely used across the world and according to Tyler (2003) boasts an impressive array of norm groups across professions. Some of these norm groups, for example, comprise applicants, non-applicants, management applicants, undergraduates, higher education workers, and a number of local and international groups. In the UK its reference norm group is said to be over 20 000 individuals (Tyler, 2003).

2.5 DEVELOPMENT OF THE NEW 15FQ+

Tyler (2003) points out that the 15FQ+ is a full revision of the original 15FQ that resulted from the development and extensive trialling of a completely new item set. The initial aim was to produce a relatively short, yet robust measure of Cattell's primary personality factors. This desire to capture the full breadth of Cattell's original source traits, aimed at comprehensively capturing the embedded mainstay of personality, guided the developers' twin aims of maximizing reliability and validity. The first-order personality dimensions measured by the 15FQ+ are depicted in Table 2.5.

2.5.1 NEW FEATURES OF THE 15FQ+

In addition to the intellectance scale discussed above, the second edition of the 15FQ+ also incorporates recent psychometric innovations which include amongst others, criterion-referenced composite scales such as a Work Attitudes scale, a Team Roles scale, a Management scale (Ones and Schmidt, 1992), an Emotional Intelligence scale (Goleman,

1996) and a Subordinate Style scale that can be generated from a sub-set of 15FQ+ items that have been found to best predict well-validated measures of the relevant constructs. According to Tyler (2003) these scores are calculated from sub-tests of the 15FQ+ items which Psychometrics Ltd (2002) have found to best predict well validated measures of the relevant constructs. In congruence with its predecessor, and mindful of response bias, the 15FQ+ incorporates an extensive range of response style indicators that include: a dedicated Social Desirability scale which is available for both the paper and pencil and computer scored versions of the long form of the test; non-dedicated Faking Good and Faking Bad scales (only available for the computer scored versions of the long form of the test); and Impression Management scales, some of which are only available through computer generated narrative reports (Psychometrics Ltd, 2002). Like the 15FQ, the 15FQ+ provides measures of Central Tendency and Infrequency Responding (Tyler, 2003; Psytech International, 2002). The 15FQ+ Manual (Psychometrics Ltd, 2002) indicates that the new Central Tendency scale highlights the possibility that respondents may have been indecisive when answering the questionnaire, or may have been reluctant to be open and direct. The new Infrequency scale identifies a random or inattentive response tendency to completing the 15FQ+.

Psychometrics Ltd (2002) mentions that the twelve items that assess each of the sixteen factors measured by the 15FQ+ resulted from the development and refinement of a series of iterative data analyses. As indicated in the 15FQ+ Technical Manual (Psychometrics Ltd, 2002, p. 5) the following process was followed:

1. A comprehensive review of each of Cattell‘s 15 factors (with the exception of intelligence) was undertaken by means of a literature review. This involved the generation of statements able to capture the full breadth of the behavioural manifestations associated with each of the personality dispositions. All statements were then simplified and/or written in modern English in an attempt to avoid culture bias. Those items of the 15 FQ that met the above criteria were used in the 15FQ+.
2. Revised item data sets were collected, alongside data on Form A of the 16 PF4. The two sets of data were analyzed to ensure that the revised items occupied the same position in the personality factor space as the factors measured by 16PF4 Form A.
3. Items yielding poor psychometric properties were then culled and new items were constructed. Only those items that had acceptable item-total correlations and correlated substantially higher with their target scale than with any other scale were retained.

4. Steps 2 and 3 were repeated iteratively until twelve items that had acceptable psychometric properties were obtained for each of the fifteen dimensions (excluding the intellectance [Factor B] dimension and Social Desirability) as independently assessed by the members of a panel of psychologists experienced in personality test construction.
5. The generated items were then reviewed by the panel and, if needed, were re-worded to reach consensus. Step 3 was repeated until twelve items that had acceptable psychometric properties were obtained for each of these scales.
6. The 16 scales including intellectance were subsequently factor-analysed using the total standardisation sample and five global factors, similar to the Big-Five originally identified in the 1950s, were extracted.
7. Once a satisfactory final item set had been achieved, the Faking Good and Faking Bad scales were constructed using criterion-referencing techniques. The Infrequency scale was constructed by selecting the twenty-six (26) items with the least frequently endorsed item response options.
8. A short form of the 15FQ+ was created by selecting the best six items from each of the 16 scales based on the item statistics calculated for each scale.

2.6 STRUCTURE OF THE 15FQ+

The 15FQ+ is available in two forms, that is, the short and standard form. The short form takes approximately fifteen minutes to complete, while the standard form takes about thirty minutes. Both formats are administrable through the traditional paper and pencil formats, the use of self-scoring answer sheets and integral profile charts, or through the use of the publisher's GeneSys™ Integrated Assessment Software. The administration of the 15FQ+ is guided by the use of detailed, standardised instructions, and with scoring being either automated (i.e. when using the software) or by collating scores from shaded boxes and then transposing the items onto the respective sten score boxes and a graphical profile chart (Tyler, 2003). The main features of the second edition of the 15FQ+, as cited by Psychometrics Ltd (2002, p. 4) are:

- Items have been revised and re-written to avoid culture, sex, and age bias.
- Items have been written in simple, clear and concise modern (European) English.
- The questionnaire has been designed to be brief; comprising of twelve items per scale.

- The items have been selected to maximise reliability while maintaining the breadth of the original personality factors.
- The questionnaire is available for both paper and pencil and on screen (computer) administration. Moreover, for the paper and pencil version of the questionnaire, self-scoring answer sheets and computer readable answer sheets are available.
- A short form, comprising just six items per scale has been developed for situations where speed of completion is more important than high reliability and validity.

2.7. 15FQ+ FIRST AND SECOND-ORDER FACTORS

The 15FQ+ comprises of five (5) Global Factors and fifteen (16) Primary Scales shown below in Table 2.4 and Table 2.5 respectively.

TABLE 2.4

15FQ+ GLOBAL FACTORS

Abbreviation	Lower scale end description	Upper scale end description
E	Extraversion	Introversion
N	Low Anxiety	High Anxiety
O	Pragmatism	Openness
A	Independence	Agreeableness
C	Low Self-Control	High Self-Control

TABLE 2.5

15FQ+ PRIMARY FACTORS

Factor symbol	Lower scale end description	Upper scale end description
Factor A	Distant Aloof	Empathic
Factor B	Low Intellectance	High Intellectance
Factor C	Affected by Feelings	Emotionally Stable
Factor E	Accommodating	Dominant
Factor F	Sober Serious	Enthusiastic
Factor G	Expedient	Conscientious
Factor H	Retiring	Socially Bold
Factor I	Hard headed	Tender-Minded
Factor L	Trusting	Suspicious
Factor M	Concrete	Abstract
Factor N	Direct	Restrained
Factor O	Confident	Self-doubting
Factor Q1	Conventional	Radical
Factor Q2	Group Oriented	Self-Sufficient
Factor Q3	Informal	Self- disciplined
Factor Q4	Composed	Tense-driven

2.8 RELIABILITY OF THE 15FQ+ MEASURES

The term 'reliability', with reference to a psychological instrument such as a questionnaire, is used to describe "the attribute of consistency in measurement" (Gregory, 1996**,** p 108). When viewed from the perspective of classical measurement theory, reliability of measurement could be more technically defined as the proportion of systematic observed score variance (Theron, 1999). This section will discuss the reliability of the 15FQ+ measure as reported in the literature by Psytech SA (2002), Tyler (2003) and other scholars. The literature indicates that the 15FQ+ has been used on a variety of samples (Tyler 2003) and that various values of the coefficient alphas were reported for the measure. For example, Meiring, Van de Vijver and Rothmann (2006) as well as Tyler (2003) report reasonable to strong reliability coefficient values of 0,60 to 0,85 for the 15FQ+ scales. Meiring, Van de Vijver and Rothmann (2006) cite reliability findings with a mean of 0,75 for South African professional and management development candidates mentioned by Tyler (2003) in his research. Specific examples of studies done in South Africa are reported by Psytech SA on its website. These include, amongst others, a study of managers in a manufacturing company (this study is discussed below), a study of South African insurance sales consultants and marketing personnel in a tobacco manufacturing company. However, its technical manual only reports Cronbach's coefficient alpha for each scale for a professional sample and two student samples.

Although the literature portrays acceptable levels of internal consistency when the length of the scales is taken into consideration (refer to Table 2.6), one still needs to critically interrogate these findings and their relevance to the sample utilized in this specific study. The present study analyses the 15FQ+ responses of a sample of Black South African managers. The critical question therefore is whether the South African status of the sample affects the generalizability of the foregoing reliability findings and whether the fact that the sample comprises Black managers in any way changes the conclusions reached by earlier research on the 15FQ+. The variability in the latent personality dimensions in the samples studied also need to be kept in mind when comparing the reliability results (Guion, 1998). Moreover, Schmitt (1996, p. 351) cautions that if alpha is used as 'proof' that a set of items have an unambiguous or uni-dimensional interpretation, the conclusion drawn may or may not be correct. High internal consistency should not be interpreted to indicate that the items measuring the scale all load on a single underlying factor.

Based on reported studies, the literature indicates that the alpha coefficients are not so high as to suggest that these factors are measuring narrow surface traits. Tyler (2003) justifies the lower levels of reliability found in the short form scales, as a function of the relative brevity (six versus twelve items) of the form C scales. Schmitt (1996) concurs with this view and indicates that alpha increases as a function of test length. However, Swailes and McIntyre-Bhatty (2002) question the argument about the length of the scale as they contend that the threshold of 0,70 can easily be achieved with a low-average inter-item correlation. For example, they point to an alpha of 0,70 which could be achieved with a 12-item scale when r_{ij} is 0,16. The latter view was already expressed by Cronbach (1951, p. 323) who concludes that:

> "….homogeneity or internal consistency of a test should be independent of its length…"

Tables 2.6 and Table 2.7 present the results reported by Tyler (2003, p. 9) for studies done in the UK and South Africa respectively showing the alpha coefficients of each of the 16 personality factors for both the standard (Form A) and the short form (Form C) of the 15FQ+.

TABLE 2.6

RELIABILITY COEFFICIENTS (ALPHA) FOR THE 15FQ+ SCALES BASED ON A UK SAMPLE

Factor	Form A student sample (n=183)	Form A professional sample (n=325)	Form C student sample (n=183)	Form C professional sample (n=325)
A	0,83	0,78	0,64	0,64
B	0,77	0,80	0,62	0,71
C	0,80	0,77	0,60	0,63
E	0,80	0,79	0,60	0,66
F	0,75	0,78	0,63	0,63
G	0,85	0,81	0,60	0,64
H	0,85	0,81	0,68	0,68
I	0,74	0,77	0,64	0,63
L	0,78	0,77	0,66	0,62
M	0,80	0,79	0,64	0,64
N	0,79	0,78	0,67	0,67
O	0,82	0,83	0,67	0,69
Q1	0,81	0,79	0,60	0,72
Q2	0,82	0,78	0,67	0,62
Q3	0,78	0,76	0,66	0,63
Q4	0,84	0,81	0,60	0,62

Adapted from Tyler (2003, p. 3).

The results presented in Table 2.6 indicate an acceptable level of reliability if one uses Clark and Watson's (1995) somewhat lenient interpretive standard, with some, however, being more acceptable than others. The results for Form A for both the Student and Professional sample show high reliability indicating that the responses to these items were the result of the systematic working of a stable set of latent variables. This is of course also aided by the length of the measure as argued by Tyler (2003) and Schmitt (1996). As for Form C which is the short version of the measure, for both the students and professional samples the reliability is acceptable but not impressive. As indicated above, Tyler (2003) attributes this to the brevity of the scale even though this is refuted by other scholars.

TABLE 2.7

15FQ+ RELIABILITY: SA MANAGERS IN A MANUFACTURING COMPANY

Scale	Scale description	Coefficient alpha
A	Distant Aloof-Empathic	0,60
B	Intellectance	0,53
C	Affected by feelings-emotionally stable	0,73
E	Accommodating-Dominant	0,66
F	Sober serious- Enthusiastic	0,80
G	Expedient – Conscientious	0,74
H	Retiring- Socially bold	0,83
I	Tough minded-Tender minded	0,72
L	Trusting-Suspicious	0,73
M	Concrete- Abstract	0,61
N	Direct- Restrained	0,74
O	Self-assured- Apprehensive	0,71
Q1	Conventional-Radical	0,73
Q2	Group oriented- Self sufficient	0,66
Q3	Informal-self-disciplined	0,52
Q4	Composed- Tense driven	0,77

From Psytech SA (2004) website.

Psytech SA (2004) provides further reliability analysis data of 15FQ+ on different South African samples which could be viewed from its website. Amongst the reported studies are the following two studies utilizing data derived from:

- South African professional and management development candidates;
- All respondents on a system that have completed the Verbal Reasoning Test.

The results of the first study are summarized in Table 2.8.

TABLE 2.8

RELIABILITY COEFFICIENTS (ALPHA) FOR THE 15FQ+ ADMINISTERED IN SOUTH AFRICA TO PROFESSIONAL AND MANAGEMENT DEVELOPMENT CANDIDATES

Scale	Scale description	Alphas Total sample N=226
A	Distant aloof - empathic	0,71
B	Intellectance	0,67
C	Affected by feelings - emotionally stable	0,76
E	Accommodating - Dominant	0,75
F	Sober serious - enthusiastic	0,71
G	Expedient - conscientious	0,81
H	Retiring - socially bold	0,82
I	Hard headed - tender minded	0,71
L	Trusting - suspicious	0,75
M	Concrete - Abstract	0,68
N	Direct - Restrained	0,73
O	Self-assured - apprehensive	0,81
Q1	Conventional - Radical	0,80
Q2	Group - orientated - Self-sufficient	0,72
Q3	Informal - Self-disciplined	0,77
Q4	Composed - Tense driven	0,78
Mean alpha		0,75

Adopted from Tyler (2003, p. 9).

The findings of the latter study are shown in Table 2.9 in which coefficient alphas for respondents are grouped for each of the 15FQ+ scales according to GRT2 Verbal Reasoning scores. In this study, individuals were classified on the basis of their verbal reasoning ability into five stanine intervals.

TABLE 2.9

RELIABILITY COEFFICIENTS (ALPHA) FOR THE 15FQ+ FOR RESPONDENTS GROUPED ACCORDING TO GRT2 VERBAL REASONING SCORES

Scale	Scale description	1 Stanine 1-2	2 Stanine 3-4	3 Stanine 5	4 Stanine 6-7	5 Stanine 8-9
A	Distant aloof - empathic	0,485004	0,612067	0,688214	0,700438	0,708751
B	Intellectance	0,690831	0,721691	0,708434	0,708751	0,702042
C	Affected by feelings - emotionally stable	0,730015	0,722773	0,737659	0,719395	0,71289
E	Accommodating - Dominant	0,481764	0,585875	0,635274	0,713841	0,734685
F	Sober serious - enthusiastic	0,734685	0,735155	0,772808	0,76411	0,760361

G	Expedient - conscientious	0,542198	0,656752	0,769292	0,759335	0,780264
H	Retiring - socially bold	0,73499	0,78397	0,700069	0,822638	0,830115
I	Hard headed - tender minded	0,624516	0,697268	0,705717	0,753769	0,72057
L	Trusting - suspicious	0,617229	0,671775	0,712758	0,728895	0,74335
M	Concrete - Abstract	0,345884	0,441842	0,561771	0,648337	0,640577
N	Direct - Restrained	0,531827	0,692865	0,728203	0,761567	0,751795
O	Self-assured - apprehensive	0,485004	0,657182	0,746758	0,71802	0,789893
Q1	Conventional - Radical	0,352169	0,533095	0,632611	0,721136	0,75713
Q2	Group - orientated - Self-sufficient	0,621998	0,682931	0,718001	0,770112	0,723697
Q3	Informal - Self-disciplined	0,506219	0,425569	0,568014	0,648238	0,658436
Q4	Composed - Tense driven	0,553978	0,719703	0,760747	0,781876	0,819576
SD	Social Desirability	0,714507	0,713061	0,703357	0,692248	0,676055

Adopted from Psytech SA (2004) website

Table 2.9 indicates that the reliability of the 15FQ+ scales increase as the verbal ability of testees increase. The results presented in Table 2.9 are depicted graphically in Figure 2.1.

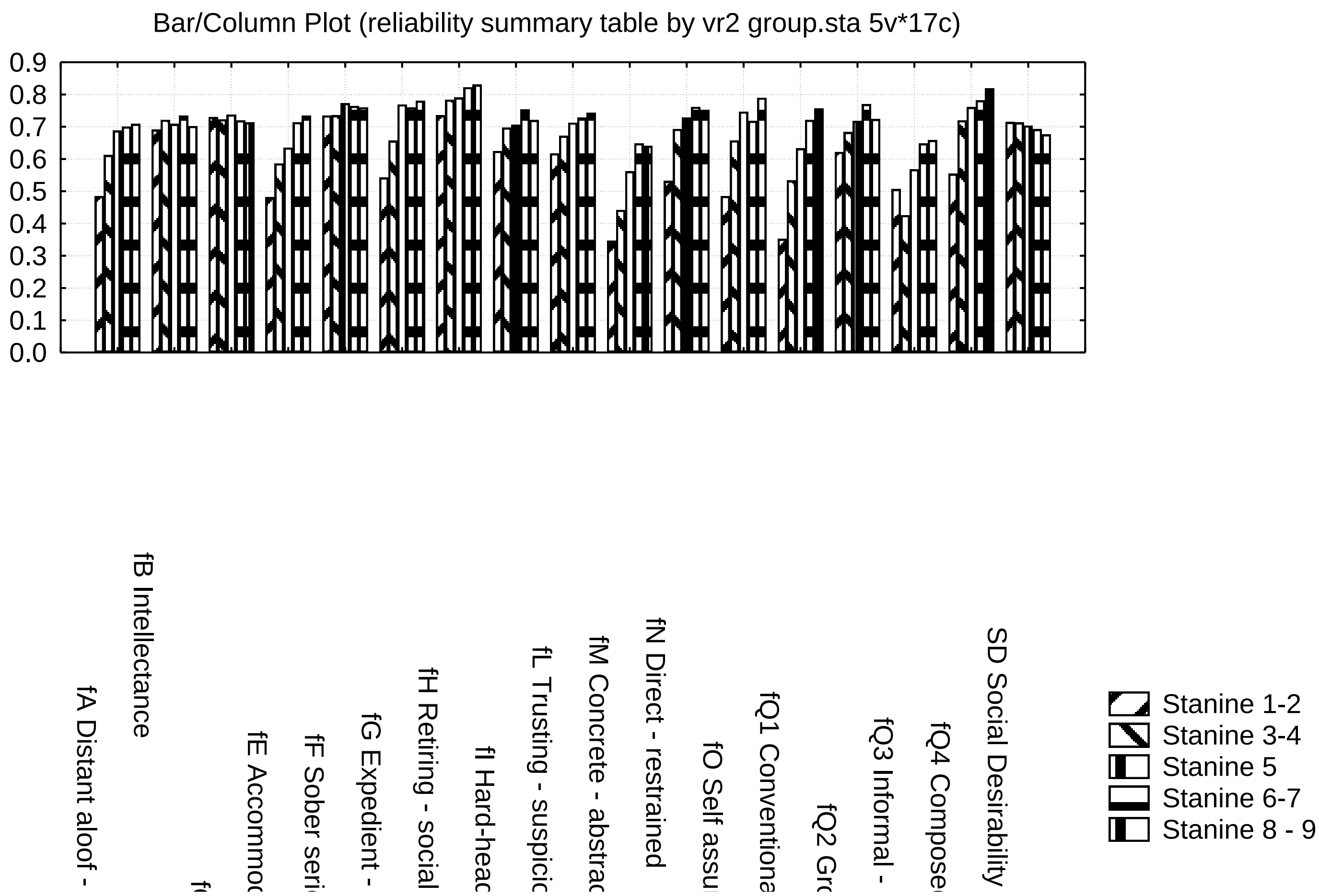

Figure 2.1 Reliability coefficients (alpha) for the 15FQ+ for respondents grouped according to GRT2 verbal reasoning scores (Retrieved from the Psytech SA (2004) website)

Other studies (which can be accessed from Psytech SA's website) reported by Psytech SA (2004) but which are not discussed in this thesis include the reliability analysis of 15FQ+ data obtained from:

- South African insurance sales consultants, and
- Marketing personnel in a tobacco manufacturing company.

Both these studies also show acceptable coefficient alphas as defined by Clark and Watson (1995) who view an acceptable level of reliability to be above 0,60. The latter viewpoint leads to the question of what an acceptable reliability coefficient is. This aspect will be discussed below. However, cognizance will be taken of the debate around the inadequacies of coefficient alphas that are far from unity as this may indicate that the items are measuring other undefined constructs as discussed above.

Tyler (2003), who has extensively researched the 15FQ+, interpreted the available reliability study results as showing that the 15FQ+ scales have acceptable levels of reliability**.** A question that arises from Tyler's conclusion is how an acceptable level of reliability is defined. Thorndike and Hagen (1977, p. 92) contend that "there is no general answer to this question", as the answer is partly influenced by the purpose of the measure in question. However, De Vellis (1991, p. 85) views the commonly acceptable lower limit for alpha to be 0,70. The reasons given for this is that below 0,70, the standard error of measurement is over half (0,55) a standard deviation of the test score (Nunnally, 1978; Thorndike & Hagen, 1977). However, these scholars also caution that alphas above 0,70 may still mask inadequacies in a data set arising from a number of reasons. In some cases, researchers like Suhr (undated) consider alphas just above 0,50 as acceptable although not convincing. Nunnally (1978) also alludes to the argument that acceptable levels of reliability depend on the purpose of the instrument. This scholar further indicates that acceptable reliability of instruments developed for research purposes could be as low as 0,60. For diagnostic instruments used for making critical decisions in applied settings about individuals (i.e., psychological measures used to measure IQ, making personnel decisions etc), it should be much higher e.g., 0,95. Gliem and Gliem (2003) cite George and Mallery (2003) who provide the following rules of thumb meant for interpreting Cronbach's alpha reliability coefficient: " > 0,90- excellent, > 0.80 - good, 0,70 - acceptable, > 60 - questionable, > 50 - poor, and < 50 – unacceptable" (p.231).

Hence this study will use the value of 0,70 as a critical reliability cut-off value when interpreting the results of the item analysis of the subscales of the 15FQ+ in the study of the construct validity of the 15FQ+. Although this is going to be the yardstick against which the reliability of subscales will be evaluated, caution should nonetheless still be exercised not just to accept the results from previous findings at a superficial level without questioning their relevance to the group being studied in this research. The concern is that the above samples were not really comparable to the present sample in as far as they did not exclusively deal with Black managerial candidates. Based on information obtained from Psytech SA (2007), no known research has been done exclusively on a Black sample. This implies that the present study is the first of its kind. This as a result would mean that the above reliability values will have to be interpreted with caution due to their questionable relevance to the sample being studied.

On the basis of the above findings, Tyler (2003) indicates that both Factor B (Intellectance) and Factor M (Concrete – abstract) fall slightly below the UK acceptable levels of reliability of 0,7. Tyler however attributes this to the possibility of educational and cultural factors that may have played a role in lowering the reliability coefficient to below 0,7 although the mean alpha for the sample remains high for personality assessment at 0,75. Psytech South Africa (2002) provides evidence of internal consistency reliability of this measure based on South African police officers tested for promotional or placement purposes during 2000-2004. This analysis only reports the results obtained for respondents for whom complete response data was available. The results of the South African Police Service study are shown in Table 2.10.

Psytech South Africa (2002) concurs with Tyler's (2003) view that literacy and education place constraints upon the test's use and interpretation. Hence Psytech South Africa (2002) recommends that the 15FQ+ should not be used for broad entry level screening outside the UK. Tyler (2003) supports this recommendation based on his findings upon using this measure in the United Arab Emirates and Saudi Arabia which compromised of a different sample from that of the UK. Although the alpha levels in the South African samples are lower than the UK samples, Tyler (2003) suggests that generally the 15FQ+ can be assumed to be a reliable measure of personality in South Africa.

TABLE 2.10

15FQ+ INTERNAL CONSISTENCY RELIABILITY OF THE 15FQ+ SCALES APPLIED TO SOUTH AFRICAN POLICE OFFICERS

Scale	Scale description	Coefficient Alpha
Factor A	Cool reserved – outgoing	0,58
Factor B	Intellectance	0,72
Factor C	Affected by feelings - emotionally stable	0,70
Factor E	Accommodating – Dominant	0,56
Factor F	Sober serious – enthusiastic	0,73
Factor G	Expedient – conscientious	0,67
Factor H	Retiring - socially bold	0,77
Factor I	Tough Minded - tender minded	0,63
Factor L	Trusting – suspicious	0,71
Factor M	Practical – Abstract	0,46
Factor N	Forthright – discreet	0,69
Factor O	Self-assured – apprehensive	0,50
Factor Q1	Conventional – radical	0,51
Factor Q2	Group - orientated - self-sufficient	0,73
Factor Q3	Undisciplined - self-disciplined	0,55
Factor Q4	Relaxed - tense driven	0,68
MEAN ALPHA		0,64

Adapted from Psytech South Africa (2002)

2.9 VALIDITY OF THE 15FQ+ MEASURES

The concurrent administration of both the 15FQ and the 15FQ+ to seventy Psytech International course delegates as part of their practical experience indicated that ten of the corrected correlations between the two instruments showed or were approaching unity. The corrections were done due to differences in the meaning of the scales. It is however not clear exactly how the corrections to the correlations were made. Factor A in the 15FQ+ for example measures a dimension defined as “Warm-hearted, empathic concern for, and interest in, other people” rather than sociability and interpersonal warmth as measured by the 15FQ dimension (outgoing) (Psychometric, 2002). Tyler (2003) indicates that of the remaining six factors, all but two correlate substantially with their respective 15FQ dimensions. The two dimensions of the 15FQ+ that provide some reason for concern are the fA (Empathic) and fQ4 (Tense-driven) scales which only show moderate correlations with their 15FQ counterparts. Tyler (2003) attributes these variations to subtle changes in scale interpretation (i.e., constitutive definitions of scales carrying the same name) between the 15FQ and the 15FQ+ tests. A question that is not clearly answered by the 15FQ+ technical manual is why there are still moderate correlations after the correlations were corrected to make provision for differences in the meaning of the scales. It does not make sense to motivate the corrections to the correlation coefficients in terms of subtle differences in the meaning of the scales but then to mobilize the same argument again to explain low corrected correlations.

Table 2.11 below presents the correlations between the primary factors as assessed by the original 15FQ and the revised 15FQ+ adopted from Tyler (2003, p. 10). The correlations shown in Table 2.10 are substantial and many of the corrected correlations approach unity. Tyler (2003) contends that this demonstrates that the 15FQ+ is measuring the factors that are broadly equivalent to those original identified by Cattell and his colleagues.

TABLE 2.11

CORRELATIONS BETWEEN 15FQ+ FACTORS AND THE FACTORS MEASURED BY THE ORIGINAL 15FQ

Scale	r[15FQ,15FQ+] uncorrected	r[15FQ,15FQ+] corrected
Factor A	0,32	0,43
Factor B	-	-
Factor C	0,54	0,75
Factor E	0,65	0,93
Factor F	0,76	1,00
Factor G	0,74	0,97
Factor H	0,88	1,00
Factor I	0,71	0,98
Factor L	0,78	1,00
Factor M	0,63	0,84
Factor N	0,55	0,77
Factor O	0,74	0,95
Factor Q1	0,86	1,00
Factor Q2	0,78	1,00
Factor Q3	0,80	1,00
Factor Q4	0,29	0,40

(Tyler, 2003, p. 10)

However, a question that arises is whether these results provide sufficient evidence on the construct validity of the 15FQ+ in general, and more specifically, whether one could make such a claim with regards to Black South African managers in particular. More generally the question that arises is whether these results hold universally across cultures and races outside the UK and specifically whether this measure can be superimposed onto South African Black professionals to measure the same constructs or traits as with the UK sample. Tyler and Newcombe (2006, p. 38) contend that “the answer to this question will depend not only on the structure of personality across different cultures, but also on the meaning of this structure and how it translates in terms of behavioural and thus performance predictions.” Therefore, the measure's wide usage in industrial and organisational settings in South Africa amongst others, in employment settings, in areas of career development, career counselling, employment selection, promotion and outplacement, employee training and development as well as coaching, warrants an investigation of this instrument's construct validity within the Black South African professional group. To answer this question would require one to first define the concept of construct validity.

2.9.1 CONSTRUCT VALIDITY

A construct is generally viewed as an abstract summary of some regularity in nature, which is related to or connected with concrete or observable entries or events (Huysamen, 1998). A more detailed definition of this concept is given below. For a test to provide a good measure of a specific construct, the abstract construct has to be translated into concrete, behavioural terms through the process of construct explication (which is a detailed description of the relationship between specific behaviours or experiences and abstract constructs). The construct is then indirectly measured via the behavioural indicators in which the construct expresses itself. Once sets of behavioural items have been developed, the question arises whether these indicators provide reliable, valid and unbiased reflections of the construct of interest.

As for the 15FQ+ which is assumed to be a mirror of its predecessor (the 16PF which is a brainchild of Cattell), one would expect to find some evidence of its construct validity when comparing it with versions of the 16PF. This could be substantiated by the results presented in Table 2.12 shown below. However, a question that arises is whether the behavioural denotations of personality the 15FQ+ uses to assess personality also provides a good measure of personality among Black South African professionals or job applicants. To answer this question would require one to ascertain the construct validity of the measure for Black South African managers. This process would essentially comprise three phases. That is [a] the explication of the manner in which the 15FQ+ relates the behaviours in which personality expresses itself to the dimensions of the personality construct to be measured (i.e., an explication of the underlying 15FQ+ measurement model), [b] the explication of the identity and manner in which other constructs are conceptually related to the latent dimensions of the personality construct (i.e., an explication of the structural model in which the personality construct is embedded); and [c] identification of behaviours in which each of these additional constructs validly and reliably express themselves. On the basis of the structural relations that conceptually exist amongst the constructs, it is then determined whether the behaviours in which each of the constructs in the nomological network express themselves correlate in a manner that can be predicted by the structural model . The more knowledge about the construct the better the chances of determining whether a test provides an adequate measure of that construct. The implication of this is that it would be easier to determine construct validity of measures of well-defined constructs than for measures of constructs that are loosely defined.

TABLE 2.12

CORRELATIONS OF THE 15FQ+ FACTORS WITH 16PF (FORM A) AND 16PF5

Scale	r[16PF,15FQ+] uncorrected (Form A)	r[16PF,15FQ+] corrected (Form A)	r[16PF5,15FQ+] uncorrected	r[16PF5,15FQ+] corrected
Factor A	0,31	0,37	0,55	0,70
Factor B	0,10	-	0,34	-
Factor C	0,59	1,00	0,81	1,00
Factor E	0,68	0,99	0,82	1,00
Factor F	0,72	0,98	0,81	1,00
Factor G	0,55	0,89	0,79[1]	0,75
Factor H	0,78	0,99	0,88	1,00
Factor I	0,50	0,75	0,47	0,56
Factor L	0,29	0,52	0,60	0,79
Factor M	0,26	0,65	0,79	1,00
Factor N	0,30	0,70	0,25	0,31
Factor O	0,68	0,99	0,83	1,00
Factor Q1	0,29	0,43	0,60	0,84
Factor Q2	0,51	0,85	0,81	1,00
Factor Q3	0,30	0,50	0,57[2]	1,00
Factor Q4	0,69	0,94	0,69	0,89
Factor G	0,49	0,72	-	-
Factor B	0,48	0,73		
			-	-

[1]*Correlation with 15FQ+ Factor fQ .correlated most substantially with the 16PF5 Factor fQ3 and the 15FQ+ Factor fQ3 correlated most substantially with the 16PF5 Factor fG. This reflects the fact that the meaning of these two factors has been reversed in 16PF5 and provides further evidence that 15FQ+ is measuring original source traits identified by Cattell and colleagues.* (Tyler, 2003, p. 10)

Theron (2002), defines construct validity as referring to [a] the extent to which a measuring instrument measures the theoretical construct it was designed to measure in accordance with its constitutive definition, or [b] the extent to which theoretical or connotative meaning can be attached to the scores obtained from a measuring instrument. The former definition is based on a deductive and confirmatory perspective on construct validity whereas the latter definition originates from an inductive and exploratory perspective on construct validity. Each of the constructs is meant to explain and organise observed response consistencies derived from established interrelationships among behavioural measures. Construct validation can be looked at from two viewpoints, that is, the analysis has to focus on either [a] the internal or the external structure, and it has to be approached either via a [b] deductive or confirmatory or an inductive or exploratory analysis. As mentioned by Theron (2002), construct validation could therefore either refer to:

1) Seeking empirical confirmation for the theoretical directives emanating from the constitutive definition on:
   - The relationships between the relevant construct and other constructs contained in a nomological network through correlation and regression analysis or through structural equation modelling (SEM), and
   - The internal factor structure through (confirmatory) factor analysis or SEM.
2) Seeking theoretical or connotative meaning of scores obtained from the measuring instrument by inferring such meaning from:
   - Correlations and regression relationships observed between measures obtained on other constructs, and from
   - The internal factor structure of the instrument derived through (exploratory) factor analysis.

Rothstein and Goffin (2000) consequently are of the view that conclusions about personality – job performance relations must be based on personality measures that have first shown evidence for construct validity, showing substantive links between items and underlying theoretical construct, and evidence of convergent and discriminant validity. The focal point of construct validation is on the role of psychological theory in test construction and the need to formulate hypotheses to be proved or disproved in the validation process (Anastasi & Urbina, 1997). The latter view underpins the essence of this research which aims to investigate through confirmatory factor analysis whether all the items of the 15FQ+ are relevant and reflect the latent personality dimension they purport to measure in the Black professional group. It should however be mentioned that more research is needed in this area since this research is the first of its kind in South Africa to focus on Black professionals to validate this measure.

Beside the data referred to in Tables 2.11 – 2.12, the 15FQ+ Technical Manual quotes further construct validity evidence. The 15FQ+ Technical Manual reports evidence in the form of correlations with other personality measures (BAR-ON EQI, the Jung Type Indicator (JTI) and the NEO PI-R) supporting the construct validity of the 15 FQ^{+}. Meiring, Van de Vijver and Rothmann (2006) also cite Tyler's (2002) evidence supporting construct validity of the 15FQ+ based on the instrument's correlations with other personality measures such as for example the 16PF, 16PF5 and the five-factor model amongst others.

The pattern of reported results is broadly similar to the pattern of correlations reported between the NEO PI-R and the 16PF5 (Psychometrics International, 2002). Notwithstanding these correlations that undoubtedly point to the construct validity of the 15FQ+, Tyler (2003) mentions that there is little criterion-related validity evidence available for the 15FQ+. This can possibly be attributed to the instrument's newness in the market. However, studies reported by Psytech South Africa (2004) highlight the ability of the 15FQ+ to predict performance appraisal outcomes for managers, supervisors and equity managers for a manufacturing company and to predict insurance policy sales (Tyler, 2003; Psytech South Africa, 2004).

The various studies done locally and internationally support the hypothesis that the 15FQ+ is a construct valid measure of personality. The available evidence does, however, not constitute very strong evidence of the construct validity of the 15FQ+. The fit of the measurement model implied by the constitutive definition of the personality construct and the design of the 15FQ+ by means of confirmatory factor analysis (CFA) has seemingly not been evaluated. Neither has the fit of a fully fledged structural model been evaluated that maps the first-order personality factors on to latent variables they are conceptually meant to be related to.

Moreover, the (tentative) conclusion that the 15FQ+ provides a construct valid measure of personality will have to be tested to determine whether it holds in South Africa particularly with regards to Black South African managers.

2.10 SUMMARY

This chapter clarified the purpose for which the 15FQ+ was developed, delineated the processes followed in the construction of the 15FQ+, explained the manner in which it conceptualizes personality and evaluated the success with which the 15FQ+ measures the personality construct. Chapter 2 moreover attempted to show that reasonable evidence exists to argue that the 15FQ+ reliably and validly measures personality as constitutively defined amongst white (South African) managers but that similar evidence with regards to Black South African managers is lacking.

CHAPTER 3
RESEARCH METHODOLOGY

3.1 INTRODUCTION

Chapter 1 argued the need for a close psychometric scrutiny of the 15FQ+ as a measure of personality widely used in South African industrial and organisational settings. The intention of this study is to do this through a factor analytic investigation into the first-order factor structure of the instrument within a Black professional group. The primary objective of the research is to undertake a comprehensive confirmatory factor analysis to determine whether all items in the test reflect the latent personality dimensions they were (according to the scoring key) designed to reflect in the group being studied. The end result of this process is to affirm or discount the use of this measure for the assessment of personality in Black South African managers. This chapter of the thesis is meant to delineate the methodology used to pursue this objective.

The architecture of the 15FQ+ reflects a specific definition of personality and a design intention to have specific items reflect specific personality dimensions. The design of the 15FQ+ in conjunction with the scoring key implies a specific measurement model which formally expresses the belief that the behavioural responses to specific items of the 15FQ+ are a function of certain underlying personality traits. The measurement model thus maps specific items onto specific first-order personality factors thereby claiming that responses to these items reflect the state of the underlying first-order factor to which it is linked. To ascertain the validity of these claims made by the 15FQ+ requires a confirmatory factor analysis in which the fit of the implied measurement model is evaluated. The credibility of the verdict on the validity of these claims depends on the methodology used to arrive at the verdict. The methodology is therefore meant to serve the epistemic ideal of science (Babbie & Mouton, 2001). Should the methodology used be flawed or unclear, this may jeopardise the chances of the researcher to arrive at a valid conclusion on the merit of the measurement model as a hypothesis on the nature of the construct the 15FQ+ is measuring and how it is measuring the specific construct. As a result, the conclusions derived on the ability of the 15FQ+ to measure the personality construct amongst Black South African managers via its premeditated design could be fundamentally flawed and seriously impair the credibility of the verdict on the merits of the 15FQ+ as a measure of personality.

Because scientific methodology is meant to serve the epistemic ideal of science, a scientific inquiry would subject its method of inquiry to critical inspection by knowledgeable members of the scientific community in which the research is being performed (via publication and conference presentations). In this sense, science could be said to be rational (Babbie & Mouton, 2001). Scientific rationality can, however, only serve the epistemic ideal of science if the method used in the scientific inquiry is comprehensively described and if the methodological choices that have been made are thoroughly motivated. This chapter will consequently provide a thorough description and motivation of the research methodology used to evaluate the ability of the 15FQ+ to measure the personality construct as it defines it via its premeditated design in selected Black South African managers.

3.2 RESEARCH PROBLEM AND RESEARCH HYPOTHESES

Previous research (Psytech SA, 2003; Tyler, 2002, 2004) has explored the psychometric properties of the 15FQ+ in various settings within and outside South Africa on inclusive groups. To date, no known study has been done on an exclusively Black sample. Despite this, the instrument is still used to assess personality amongst Black South Africans. There is therefore a need to investigate the validity of this instrument as a measure of personality within this group in the South African setting.

The substantive hypothesis tested in this study is that the 15FQ+ provides a valid and reliable measure of personality as defined by the instrument, amongst Black South African managers.

The substantive hypothesis translates into the following specific operational hypotheses:

- The measurement model implied by the scoring key of the 15FQ+ can closely reproduce the co-variances observed between the item parcels[6] formed from the items comprising each of the sub-scales,
- The factor loadings of the item parcels on their designated latent personality dimensions are significant and large,
- The measurement error variances associated with each parcel are small,
- The latent personality dimensions explain large proportions of the variance in the item parcels that represent them, and

[6] The formation of item parcels will be motivated and explained in paragraph 4.6.1.

- The latent personality dimensions correlate low to moderately with each other.

3.3 RESEARCH DESIGN

The objective of the proposed research is to empirically investigate the factor structure of the 15FQ+ as a psychological measure widely used within the South African workplace context through confirmatory factor analysis. More specifically, the research objective is to contribute to the investigation of the extent to which it is permissible to use the 15FQ+ as a measure of personality amongst Black South African managers.

The research objective is pursued by testing the operational research hypothesis as outlined in the previous paragraph. It is, however, not suggested that a single study of this nature will allow for a decisive verdict on the construct validity of the 15FQ+ as a measure of personality amongst Black South African managers. Apart from the fact that the sample is too small and not representative of the population of Black South African managers, satisfactory measurement model fit would constitute insufficient evidence to confidently conclude the construct validity of the 15FQ+. To achieve a comprehensive investigation into the construct validity of the 15FQ+ would require the explication of the nomological network in which the personality construct is imbedded and confronting the resultant structural model with empirical data. It is also thereby not implied that if satisfactory measurement model fit would be obtained in this study that the 15FQ+ would be unequivocally cleared for use as a selection instrument for the selection of Black South African managers. Lack of measurement model fit would, however, seriously erode confidence in the construct validity of the instrument and would raise questions on the use of the instrument for the selection of Black South African managers.

The research design aims to investigate the merits of the stated operational research hypothesis through a systematic empirical enquiry in such a way that the results obtained could be used and interpreted unambiguously for or against the operational hypotheses. To achieve this goal, a quantitative technique based on a correlational *ex post facto* design will be used. This research design directs the researcher to observe the indicator variables comprising the 15FQ+ measurement model individually and to establish the extent to which they co-vary. Kerlinger (1973) and Theron (2002a) view the research design as an investigative plan and structure to find unambiguous answers to the research question by testing the operational research hypothesis and to control variance.

Typically the operational research hypothesis would exist as a tentative relational statement hypothesizing a specific relationship between at least one independent observed variable (X) and at least one dependent observed variable (Y). In its simplest form the operational hypothesis would therefore take on the form “If X changes in a specific way then Y will change along with it in a specific way.” It is against this background that Kerlinger (1973), Kerlinger and Lee (2000) and Theron (2000a) argue that to be able to obtain a credible and an unequivocal interpretation of the results for or against the operational research hypothesis, the research design must have the ability to distinguish the variance in Y attributable to the independent variable of interest (X), from the Y- variance attributable to other non-relevant X- variables (e.g., error or within-group variance and extraneous between group or error variance). Thus, to be able to achieve this objective, Kerlinger and Lee (2000) and Theron (2000a) maintain that the research design should have the ability to control variance through MAXMINCON meaning:

- The maximisation of systematic variance (to increase the likelihood that H_0 will be rejected during statistical testing)
- Minimization of error variance (meant to increase the likelihood that the effect of X on Y becomes “visible” amongst or discernable from the effect of other, non-relevant X’s on Y) – which could be enhanced by ensuring the reliability of the measurements;
- Control of extraneous variance. This can be addressed by incorporating confounding extraneous variables into the design, by treating them as covariates in the statistical analysis.

In the case of this study the substantive and operational research hypotheses are, however, not characterized by the traditional relational structure in which it would be meaningful to refer to a dependent/endogenous variable and an independent/exogenous variable in the normal sense of the terms. This particular study focuses on a single multidimensional latent variable “personality” without embedding it in specific structural relationships with other latent variables[7]. The personality dimensions in terms of which the 15FQ+ conceptualizes personality could in principle operate as endogenous or exogenous latent variables in a structural model. Does this mean that the concept of research design is irrelevant to this study?

Although the measurement model implied by the scoring key of the 15FQ+ by definition does not hypothesize structural relations between latent variables, it does hypothesize specific measurement relations (see Equation 1 below) between the items comprising the instrument and the personality dimensions measured by the instrument. More specifically the measurement model assumes that the slope of the regression of specific indicator variables (X) on the specific latent variable (ξ) the indicator variable is meant to represent is positive and significantly greater than zero. In addition the measurement model makes assumptions about the co-variance between the latent variables and the co-variance between the measurement error terms.

To empirically test the merits of the assumptions made by the measurement model still requires some plan or strategy. The concept of a research design is therefore still relevant to this research study even though the traditional way of thinking about research designs might not be appropriate.

This study will use a correlational research design, which is one of the *ex post facto* research designs. With this form of research design, the researcher does not have direct control over the observed variables. This is because, according to Kerlinger (2000), their manifestation(s) would have already occurred or they are not inherently manipulable. Experimental manipulation and randomisation are not possible in *ex post facto* research unlike in experimental research designs. In terms of the logic of the *ex post facto* correlational design the researcher observes the observed variables[8] and calculates the co-variance between the observed variables. Estimates for the freed measurement model parameters are obtained in an iterative fashion with the purpose of reproducing the observed co-variance matrix as accurately as possible (Diamantapoulos & Siguaw, 2000). If the fitted model fails to accurately reproduce the observed co-variance matrix (Byrne, 1989; Kelloway, 1998) the

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[7] If a comprehensive investigation into the construct validity of the 15FQ+ would have been the objective of the research it would have been necessary to explicate this nomological network in which the personality construct is imbedded.

[8] These could be individual items or item parcels as linear composites of individual items.

conclusion would inevitably follow that the measurement model implied by the 15FQ+ scoring key does not provide an acceptable explanation for the observed co-variance matrix and thus that the 15FQ+ does not measure the personality domain as intended in the Black South African sample. The converse, however, is not true. If the co-variance matrix derived from the estimated model parameters closely corresponds to the observed co-variance matrix it would not imply that the processes postulated by the measurement model necessarily must have produced the observed co-variance matrix and that the 15FQ+ thus measures the personality domain as intended. A high degree of fit between the observed and estimated co-variance matrices would only imply that the processes portrayed in the measurement model provide one plausible explanation for the observed co-variance matrix.

Inferences about the hypothesized causal relations existing between the latent variables ξ_j and the observed variables X_i and about the correlational relations hypothesized to exist between the latent variables are made from concomitant variation observed between the observed variables. Thus this method involves the observation of several X's to determine whether and to what extent the relationships postulated by the scoring key and the design intention of the 15FQ+ exists between the indicator variables and the latent personality dimensions they were meant to represent.

The consequence of this, amongst other, is that the variables must be observed as they naturally occur. Consequently, the key and omnipresent problem in non-experimental research is that an observed relationship between the independent variables and dependent variables may be spurious (that is, it may not be a causal relationship, but one emanating from one or more unknown variables). Figure 3.1 below illustrates this problem as it would apply to the present study. The latter argument will be elucidated below as part of the limitations of this research design.

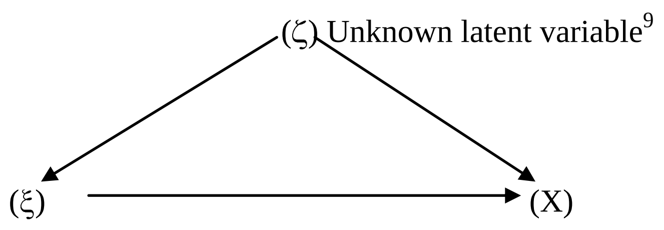

Figure 3.1. The problem of spuriousness.

[9] The use of the symbol zeta to represent the "third variable" is somewhat unconventional in as far as the concept of structural error is normally only associated with endogenous latent variables.

The measurement model that postulates specific measurement relations between the latent personality dimensions and the items used to reflect them would acknowledge that the indicator variables do not succeed in providing error-free reflections of the latent variables they were designed to reflect. This is formally acknowledged by making provision for measurement error terms (δ_i) in the measurement model (see Equation 1 below). The measurement error term only acknowledges that the latent variable to which the indicator has been linked does not fully account for the variance observed in the indicator variable and that systematic and random error influences also produce variance in the indicator variable. The possibility exists that a systematic error factor included in δ might also causally affect ξ so that the relationship between ξ and X might actually be spurious even though it is modelled as a causal relationship.

The *ex post facto* research design is often appropriate for dealing with large problems of social and human importance, for example political issues, public attitudes and social class. However, notwithstanding its applicability in dealing with large problems, Kerlinger and Lee (2000) note that the design has three major inter-related limitations. These are:

- Its inability to manipulate the independent variables (in this case the latent personality dimensions). As a result, this may not provide strong evidence of causality compared to the evidence that would have been derived from experimental research designs. This points to the inherent weaknesses of the design. Hence its use must be treated with caution.
- The lack of power to randomise. Hence the researcher has to take things as they naturally occur and try to disentangle them.
- The risk of improper and erroneous interpretations (i.e. lack of control) which stem in part from the existence of many plausible alternative explanations or interpretations for the observed relationship(s) if one is to draw a causal conclusion from complex events.

This is especially risky in the absence of clearly formulated hypotheses, which is, however, not true for this study. Because of the above flaws, which could result in erroneous conclusions on the "truth" of the hypothesized relations between ξ and X, Kerlinger (2000) warns that results from *ex post facto* design should be treated with caution. However, the value of *ex post facto* design is that most research in social sciences does not lend itself to experimentation. Kerlinger and Lee (2000), however, mention that a certain degree of controlled enquiry may be possible, but experimentation is not, thus making an *ex post facto* design valuable in this regard.

3.4 STATISTICAL HYPOTHESES

The architecture and the scoring key of the 15FQ+ implies a hypothesis on the manner in which the individual test item scores are expected to be influenced by the dimensions of the personality construct as defined by the 15FQ+. The hypothesis on the manner in which the responses of test takers to the 15FQ+ items are meant to be related to the sixteen underlying first-order latent personality dimensions is graphically depicted as a measurement model. Whether it is justified to make inferences about the sixteen personality dimensions in the manner dictated by the scoring key depends on the fit of the measurement model and the strength of the loading of the items on the underlying latent variables.

The nature of the envisaged statistical analyses will necessarily affect the decision as to whether statistical hypotheses should be formulated and the format in which they will be formulated. One possibility would have been to use an unrestricted, exploratory factor analytic approach in which no *a priori* stance is taken on the number of factors underlying the observed co-variance matrix, their identity and the manner in which the items load on the factors (Ferrando & Lorenzo-Seva, 2000). If this option would have been chosen no statistical hypotheses would have been formulated. To utilize this option, however, seems inappropriate in as far as it denies or ignores the design intentions of the developers of the 15FQ+.

In the case of the 15FQ+ a very specific stance is taken on the number of factors underlying the observed co-variance matrix, their identity and the manner in which the items load on the factors. Operational denotations were explicitly and intentionally produced to reflect specific dimensions of this construct. Specific 15FQ+ items were written to function as stimulus sets to which test takers would respond with behaviour which would be behavioural expressions of specific latent personality dimensions. It is, however, very difficult, if not impossible, to isolate behaviour in which only a single personality dimension would express itself. Behaviour tends to reflect the whole personality. The responses to the items of a specific subscale are therefore seen to be also affected (positively and negatively) by the fifteen remaining primary personality factors, albeit to a lesser degree. Geometrically, therefore, all the items of a specific subscale are not tightly clustered around the high end of the specific factor in the 16 dimensional factor space. Rather all the items of a specific subscale load reasonably high on the specific underlying factor but are scattered (Gerbing & Tuley, 1991, p. 275) "over much of the factor space because of their mixed pattern of loadings on the additional factors." This pattern of positive and negative loadings on the remaining factors results in a *suppressor action* in which the effect of the remaining factors is cancelled out when composite scores are calculated for the subscales (Cattell *et al.*, 1970; Gerbing & Tuley, 1991). The suppressor action is important to ensure that a true (i.e., uncontaminated) measure is obtained of a specific but broad personality factor given the impossibility of writing behavioural items in which only the factor of interest expresses itself.

It seems only fair towards the developers of the instrument that the question that needs to be answered first is whether their premeditated operational design succeeded in providing a comprehensive and uncontaminated empirical grasp of the construct as defined. A hypothesis testing, restricted, confirmatory factor analytic approach should therefore rather be followed. In terms of this approach specific structural assumptions are made with regards to the number of latent variables underlying the 15FQ+, the relations among the latent variables and the specific pattern of loadings of indicator variables on these latent variables (Ferrando & Lorenzo-Seva, 2000; Jöreskog & Sörbom, 1993). The measurement model reflecting these structural assumptions is shown in Figure 3.2. A controversial question is whether the measurement model should not also make provision for the assumed patterns of positive and negative loadings of items allocated to a specific subscale on the remaining factors. It would seem imperative to try and attempt to model this very fundamental design principle. The nature of the pattern of positive and negative loadings is, however, not specified in any specific detail by the developers. This makes it difficult to accommodate this design principle in a hypothesis testing, restricted, confirmatory factor analytic approach. Moreover, if all elements of Λ_X would be freed the measurement model would be over-identified (Diamantopoulos & Siguaw, 2000). These considerations, however, do not convincingly justify excluding the suppressor action from the fitted model. Not formally modelling the suppressor action has the effect that the measurement model depicted in Figure 3.2 does not fully reflect the operational design intentions of the 15FQ+.

To the extent to which a measurement model reflecting these assumptions would fit empirical data poorly, the measurement intention of the test developers would have failed. If the verdict would go against the measurement claims of the test developers, given that they have been given a fair hearing, it would seem more justified to use an unrestricted, exploratory factor analytic approach to estimate the number of factors underlying the observed co-variance matrix, speculate on their identity and the manner in which the items load on the factors. Structural Equation Modelling utilizing LISREL will be used to test the hypothesis that the measurement model implied by the 15FQ+ scoring key can explain the observed co-variance matrix.

More specifically the following exact fit null hypothesis will be tested:

H_{01}: $\Sigma=\Sigma(\theta)$

H_{a1}: $\Sigma\neq\Sigma(\theta)$

where Σ is the observed population co-variance matrix and $\Sigma(\theta)$ is the derived or reproduced co-variance matrix obtained from the fitted model (Kelloway, 1998). In its alternative format the exact fit hypothesis could be formulated as (Browne & Cudeck, 1993):

H_{01}: RMSEA=0

H_{a1}: RMSEA>0

The exact fit null hypothesis represents the somewhat unrealistic position that the first-order measurement model is able to reproduce the observed co-variance matrix to a degree of accuracy that could be explained in terms of sampling error only. Browne and Cudeck (1993, p. 137) consequently argue:

> In applications of the analysis of co-variance structures in the social sciences it is implausible that any model that we use is anything more than an approximation to reality. Since a null hypothesis that a model fits exactly in some population is known a priori to be false, it seems pointless even to try to test whether it is true.

Assuming that the first-order measurement model depicted as Figure 3.2 only approximates the processes that operated in reality to create the observed co-variance matrix, the following close fit null hypothesis will also be tested (Browne & Cudeck, 1993):

H_{02}: RMSEA≤0,05

H_{a2}: RMSEA>0,05

If H_{01} and/or H_{02} would not be rejected (i.e., exact or close model fit would be found) or if at least reasonable model fit would be obtained (as indicated by the basket of fit indices produced by LISREL) the following 32 null hypotheses on the slope of the regression of item parcel j[10] on latent personality dimension k will be tested:

H_{0i}: $\lambda_{jk}=0$; i=3, 4, …, 34; j=1, 2, …, 32; k=1, 2, …, 16

H_{ai}: $\lambda_{jk}\neq0$; i=3, 4, …, 34; j=1, 2, …, 32; k=1, 2, …, 16

These 34 hypotheses will form the basis for examining the merits of the claim made by the developers that the 15FQ+ successfully measures the sixteen primary personality dimensions it intends to measure and in the manner that it intends to do according to the scoring key.

3.5 STATISTICAL ANALYSIS

In accordance with the proposed relationships amongst the latent variables as postulated by the 15FQ+, Structural Equation Modelling (SEM) based on LISREL was used to factor analyse the parcelled data set.

Ullman (1996) cited in Davidson (2000, p. 709) describes Structural Equation Modelling as "a collection of statistical techniques that allow for the examination of a set of relationships between one or more independent variables (IV), either continuously or discretely, and one or more dependent variables (DV), either continuously or discretely". In support of the use of the SEM as an analysis technique, Kelloway (1998) writes that [a] SEM allows the researcher to determine how well these measures reflect the intended constructs, [b] SEM permits the testing and specification of more complex path models in addition to testing the components comprising the model to make sound predictions, and [c] it provides a flexible yet powerful method that caters for the quality of measurement which is very important in the evaluation of the predictive relationships amongst the underlying latent variables. For the reasons stated above, this study selected SEM as a statistical analysis technique. In undertaking this, this study looked at five distinct but related steps that characterize most applications of SEM (Bollen & Long, 1993):

- Model specification
- Evaluation of model identification

[10] See paragraph 3.5 below for an explanation as to why item parceling was used.

- Estimation of model parameters
- Testing of model fit, and
- Model re-specification

The design and structure of the 15FQ+ implies a specific factor structure or measurement model. The strength of structural equation modelling (SEM) derives from the ability of this analytical technique to assess the fit of theoretically derived predictions on the nature of the relationships existing between indicator variables and latent variables and on the nature of the relationships existing between latent variables (in the form of a measurement model) to the data.

The aim of the study is not to evaluate the use of the 15FQ+ to provide item parcel indicator variable measures for personality latent variables in a structural model. The aim of the study is rather to evaluate the 15FQ+ psychometrically as a freestanding measure of personality. The ideal approach therefore would have been to fit a measurement model in which the individual items serve as indicator variables of the latent personality dimensions. The individual 15FQ+ items would then have to be treated as ordinal variables due to the nature of the three point scale used to capture the responses of test takers (Jöreskog & Sörbom, 1996a; 1996b). Structural equation modelling on the 15FQ+ in which each individual item serves as a manifest or indicator variable of the various latent personality dimensions would, however, have resulted in an extremely cumbersome and extensive exercise simply due to the number of items involved. Fitting a measurement model in which each individual item serves as an indicator variable of the latent personality dimension would have required the estimation of 504 model parameters (192 factor loadings, 192 measurement error variances and 120 co-variance terms). This would have placed formidable demands on the required sample size since the number of observations at least has to exceed the number of parameters to be estimated (Jöreskog & Sörbom, 1996a; 1996b). The ordinal nature of the data would moreover have required the calculation of the (192x192) asymptotic co-variance matrix which tends to demand large amounts of memory and processing time when the number of variables is large (Jöreskog & Sörbom, 1996a; 1996b).

In an attempt to circumvent these problems two parcels of manifest variables (each containing 6-items) were created from each sub-scale by parcelling items that underlie each of the latent personality constructs. The item parcelling was done by placing the first question in parcel A and the second in parcel B. This method was followed up to the last item by placing items into two parcels by alternating them as indicated above. A parcel is perceived as a mean score (linear composite) across a set of items (i.e., it is a mini-scale). These parcels are treated as continuous indicators.

Prior to the development of the thirty-two item parcels, item analysis was used to examine the assumption that the items comprising each sub-scale of the 15FQ+ do in fact reflect a common underlying latent variable. The developers of the 15FQ+ intended to construct essentially one-dimensional sets of items to reflect variance in each of the sixteen latent personality traits collectively comprising the personality domain. The items are meant to function as stimulus sets to which test takers respond with behaviour that is a relatively uncontaminated expression primarily of a specific underlying first-order personality latent variable.

High internal consistency reliability for each sub-scale, high item-sub-scale total correlations, high squared multiple correlations when regressing items on linear composites of the remaining items comprising the sub-scale and other favourable item statistics will, however, not provide sufficient evidence that the common underlying latent variable is in fact a uni-dimensional latent variable. In the conceptualization of the personality construct and in the design of the 15FQ+ the fundamental assumption was that each of the sixteen first-order personality factors is in fact a uni-dimensional latent variable. Again it needs to be reiterated that it is thereby not implied that each of the sixteen first-order personality dimensions is a narrow, very specific construct. Rather each primary personality dimension represents a somewhat broader facet of personality that expresses itself in a wide array of specific behaviours. Nonetheless each of the items comprising each of the sixteen subscales of the 15FQ+ is expected to load (albeit rather modestly) on a single factor. In none of the publications on the 15FQ or the 15FQ+ is the position formally held that the primary factors can be further subdivided into more specific sub-factors. Provision is made for the fusion of the sixteen primary factors into five global factors (see Table 2.4). Provision is, however, not made for the fission of the primary factors into narrower, more specific sub-factors. Provision is made for a suppressor action effect due to a random pattern of positive and negative loadings on the remaining personality dimensions.

Unrestricted principal axis factor analysis with varimax rotation was consequently performed on each on the sixteen 15FQ+ subscales, each representing a facet of the multi-dimensional personality construct to evaluate this assumption. The exploratory factor analyses performed on the sub-scales would moreover shed additional light (via the magnitude of the factor loadings) on the success with which each item represents the common core underlying the sub-scale of items it forms part of. Principal axis factor analysis was chosen as analysis technique rather than principal component analysis because the aim was to determine the number of underlying factors that need to be assumed to account for the observed co-variance between the items comprising each subscale. Principal component analysis, on the other hand, analyses common variance as well as error- and unique variance and attempts to find a smaller set of linear composites of the subscale items that account for as much of the total variance as possible (Tabachnick & Fidell, 1996). Varimax rotation was chosen as rotational technique over an oblique rotational technique because the expectation was that the dimensionality analyses would corroborate the assumption that the items comprising each sub-scale of the 15FQ+ do in fact reflect a single underlying latent variable and therefore that that rotation of the extracted solution would not be required. If more than one factor would emerge, orthogonal rotation would allow for more straight-forward interpretation and reporting of the results than would be in the case of oblique rotation (Tabachnick & Fidell, 1996). At the same time, however, the assumption of orthogonal factors could be criticized as unrealistic[11].

Figure.3.2 below portrays the graphical representation of the first-order measurement model implied by the scoring key of the 15 FQ$^+$ when the items comprising each of the sixteen sub-scaled would be parcelled into two linear composites for each sub-scale (paragraph 4.6.1 presents a discussion of the item parcelling procedure).

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[11] If the extraction of multiple factors was considered an unlikely event, it could be argued that a greater willingness should have existed to utilize a somewhat more complex but at the same time more realistic oblique rotational technique.

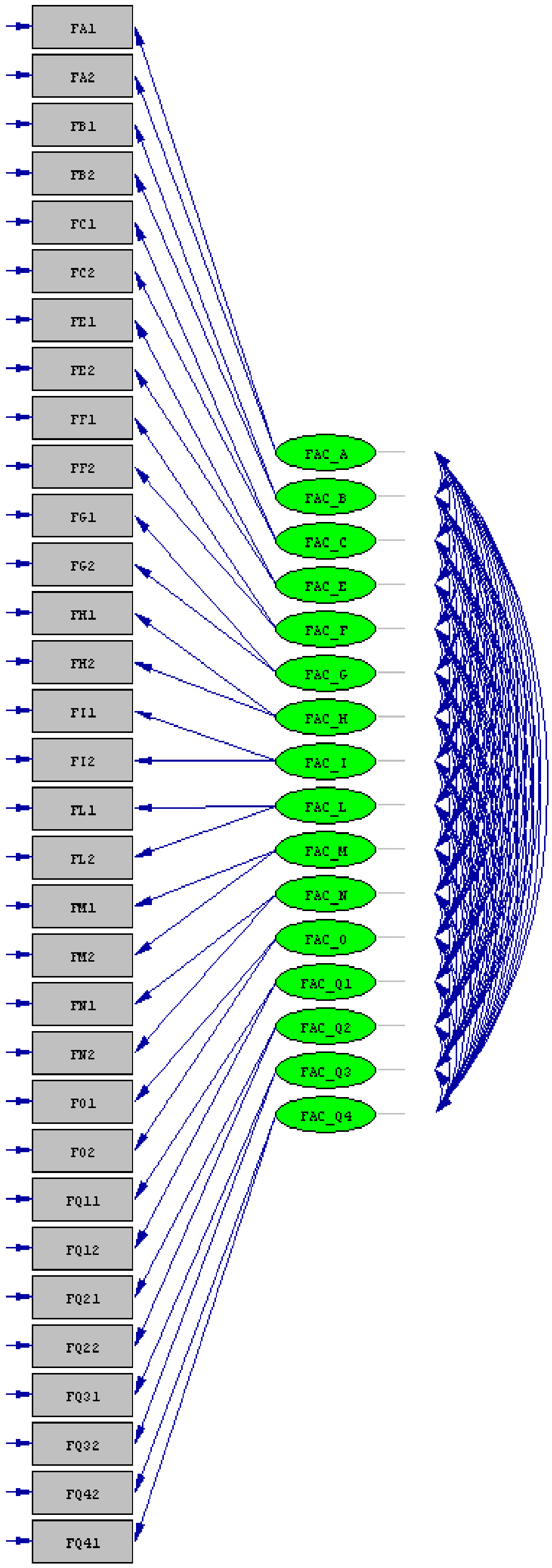

Figure 3.2 15FQ+ measurement model

The 15FQ+ measurement model as depicted in Figure 3.2 can be defined in terms of a set of measurement equations as expressed in equation 1.

$$X = \Lambda_X \xi + \delta \qquad (1)$$

Where:

- X is 32x1 column vector of observable indicator [item parcel] scores;
- Λ_X is a 32x16 matrix of factor loadings;
- ξ is a 1x16 column vector of first-order latent personality dimensions, and
- δ is a 32x1 column vector of unique or measurement error components consisting of the combined effect on X of systematic non-relevant influences and random measurement error (Jöreskog & Sörbom, 1993).

Given the fact that a hypothesis testing, restricted, confirmatory factor analytic approach was used in the psychometric evaluation of the 15FQ+, specific structural assumptions were made pertaining to the number of latent variables that underlie personality, the relations among the latent variables, and the specific pattern of loadings of indicator variables (Theron & Spangenberg, 2004). The confirmatory factor analysis (CFA) technique (as part of the SEM family) is a hypothesis-testing procedure designed to test hypotheses about the relationships between items and factors whose number and interpretation are pre-determined (Skrondal & Rabe-Hesketh, 2004). Hence in the confirmatory model particular model parameters are set to prescribed values. These assumptions are primarily (but not exclusively) reflected in the order of the factor loading matrix Λ_X (specifically the number of columns in lambda-X) and the pattern of freed and fixed factor loadings within the matrix. The measurement model implies two additional matrices. A symmetric 16x16 co-variance or correlation matrix Φ (phi) contains the correlations between the latent personality dimensions. The 15FQ+ measurement model depicted in Figure 3.2 assumes that the primary personality factors should be correlated. A diagonal 16x16 matrix θ_δ (theta-delta) shows the variance in error terms associated with the indicator variables. The diagonal nature of the θ_δ matrix implies that the error terms δ_i and δ_j are assumed to be uncorrelated across the indicator variables (Spangenberg & Theron, 2004).

To determine the goodness-of-fit of the proposed measurement model expressed as equation 1 above, LISREL 8.54 (Du Toit & Du Toit, 2001) was used to test the null hypotheses of exact and close fit formulated in paragraph 3.4. The data was read into PRELIS to compute the co-variance and asymptotic co-variance matrices required due to the assumed continuous nature of the item parcels. Robust maximum likelihood estimation (RMLE) was used to derive model parameter estimates due to the failure of the data to satisfy the multivariate normality assumption[12].

In specifying the model, the scales of the measurement of the latent variables were not specified by setting the factor loadings on the first observed variable to unity. In the case of a single-group analysis Jöreskog and Sörbom (1993; 1998) contend that instead of defining the origin and unit of the latent variable scales in terms of observable reference variables, the latent variables should rather be standardized. In terms of this option the unit of measurement becomes the standard deviation $\sigma_i(\xi)$ (Spangenberg & Theron, 2004).

All the factor loadings of each of the latent personality variables of the 15 FQ^+ were set free to be estimated. This was however only done with regards to the item parcels containing the items designated to reflect each of the sixteen personality factors. All the remaining elements of Λ_X were fixed at zero loadings to reflect the assumption that each item parcel only reflects a single specific latent personality dimension and thereby the assumed factor simplicity of the 15FQ+ items (Tabachnick & Fidell, 1989). All the elements of the Φ matrix and the main diagonal of the θ_δ matrix were treated as free by default.

Kline (2004) indicates that where an *a priori* measurement model is reasonably correct, the following pattern of results should be obtained:

- Indicators (manifest variables) specified to measure a common underlying factor should all have significant and relatively high standardised loadings on that factor; and
- Estimated correlations between the factors should not be excessively high, for example, should not exceed 0,85.

The latter point to the discriminant validity while the former indicates convergent validity. However, in a case where the measurement model reflecting these assumptions fits the empirical data poorly, the research would have failed to achieve its objectives. This may as a result, require the re-specification and re-analysis of the measurement model.

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[12] See paragraph 4.6.2 below for detail on the evaluation of the multivariate normality assumption.

3.6 SAMPLE DESIGN

The data used for this study was drawn from a large database of the 15FQ+ psychometric test scores provided by Psymetric (Pty) Ltd, a Human Capital Assessment and Consulting company, with the permission of Psytech SA. The database contained the individual raw item scores for each of the items comprising the 15FQ+, and self-reported information on each respondent's gender, age, language, disability, referral organisation and education. The original database comprised all races (Blacks, Coloureds, Indians and Whites), and therefore had to be sifted to get an exclusive sample of Black South African managerial respondents only, given the objective of this study. The data was obtained by means of a series of non-probability samples of all South African Black professionals who were assessed by Psymetric for various positions as requested by their client organisations across different industries and occupations or jobs. The assessments were completed between April 2001 and May 2006 in different settings but under the same standardised conditions to aid in a selection process. The initial sample comprised two hundred and ninety respondents. Of this, forty-nine cases had incomplete scores and were excluded from the final sample which was two hundred and forty-one (148 males and 93 females) respondents as discussed below. The respondents' ages ranged from 22 to 57 years. In some cases certain applicants' information such as age, qualifications, and occupation was missing. In such circumstances, the researcher took a principled decision to include these respondents as long as their test scores were complete. This may however have slightly compromised the accurate reporting on the sample's average education level, age and occupation. An accurate description of the composition of the research sample would have been desirable because these characteristics all probably influence how test takers respond to the item stimuli comprising the 15FQ+. This shortcoming will need to be taken cognisance of in future research.

Because of the sampling methodology and the sample size, this study can clearly not claim to have used a representative section of the target population. Neither can generalizations be made about the 15FQ+ research results of this study. As a result, this will limit the possibility of reaching any definitive conclusion on the applicability of the 15FQ+ to Black South African managers in organisational settings in South Africa. Nonetheless, if the measurement model implied by the instrument design fits the sample data well, it would constitute relevant, but limited evidence that the 15FQ+ can be used as a measure of personality construct in multi-cultural settings especially amongst Black professionals in South Africa. A conclusive vindication of the use of the 15FQ+ as a measure of personality in diverse, multi-cultural groups in South Africa would require a demonstration of the measurement equivalence (or invariance) of the measurement model parameters across groups (Vandenberg & Lance, 2000). This would require the fitting of the 15FQ+ measurement model in a multi-group SEM analysis (Vandenberg & Lance, 2000).

3.7 MEASURING INSTRUMENT

This study used the standard 15FQ+, a self-report personality assessment instrument comprising two hundred questions, which was developed in the United Kingdom by Psytech International as a measure of personality within industrial and organisational settings. The instrument was not especially adapted for South African conditions.

The questionnaire consisted of single statement items requiring a response on a three-point Likert scale. The sixteen scales (primary personality factors) were developed using a construct-oriented approach (Hough & Paullin, 1994). A rational scoring procedure was used for items in each of the scales. Since its development, this instrument has been used in various countries whose populations may not necessarily resemble that of the United Kingdom. For example, it has been, and continues to be widely used in the multi-cultural South African organisational and industrial settings, as well as internationally in countries like Australia, New Zealand, China, the United Arab Emirate and other countries for personnel assessment and selection purposes. Its wide usage beyond the borders of its country of origin therefore necessitates the need to obtain empirical proof (through investigative factor analysis) that the relationships between item responses and first-order personality factors postulated by the architecture of the 15FQ+ (which by implication proposes a certain measurement model) provides a plausible explanation for the observed inter-item correlations.

In undertaking this assessment, the respondents completed the 15FQ+ in paper and pencil format. The test was administered by qualified administrators (psychometrists and psychologists) who followed standardized procedures and testing conditions in all venues. Before the commencement of testing, every respondent completed consent and biographical information forms. The questionnaire was then presented in booklet form and participants had to choose and colour in the appropriate responses from three options in the corresponding spaces on the answer sheet. There was no time limit for this test, but the respondents were informed of how long it generally takes to complete the test.

3.8 SUMMARY

This chapter described the research methodology and the hypotheses that were tested. It also discussed the statistical procedures that were used to evaluate the data. The following chapter will present the results of the analyses.

CHAPTER 4
RESEARCH RESULTS

4.1 INTRODUCTION

The measurement model derived from the architecture of the 15FQ+ and the design intentions of its developers hypothesize specific systematic relationships between specific indicator variables (item parcels) and specific latent first-order personality variables. The measurement model simultaneously hypothesizes the absence of systematic relationships between specific indicator variables (item parcels) and specific latent first-order personality variables. The measurement model therefore hypothesizes that each of the 16 latent first-order personality variables will only systematically affect the manner in which those being tested respond to those items that, according to the scoring key, were designed to reflect the specific latent variable in question and not systematically affect the responses to any of the other items. The measurement model indirectly acknowledges the fact that the 15FQ+ is based on the design principle that the items of each subscale primarily reflect a specific personality dimension (i.e., they have moderately high loadings on that dimension) but then are scattered throughout the remainder of the personality space. The calculation of two item parcels for each subscale should also allow for the operation of the suppressor action brought about by the pattern of positive and negative loadings that is assumed to control contamination when the dimension scores are calculated on each subscale (Gerbing & Tuley, 1991).

In accordance with these proposed relationships amongst the indicator variables and the underlying latent variables they are meant to represent as depicted in Figure 3.2, specific statistical hypotheses were formulated. Two overarching statistical hypotheses were formulated on overall model fit and 32 specific statistical hypotheses on the significance of the freed factor loadings in the factor loading matrix. The aim of this chapter is to present the results of the statistical analyses aimed at testing these stated null hypotheses. This chapter will start off by discussing how the missing values were treated. It will further detail the results of the dimensionality analyses and item analyses executed to determine the psychometric integrity of the indicator variables meant to represent the various latent personality dimensions within the architecture of the 15FQ+.

4.2 MISSING VALUES

This dataset had missing values beyond the researcher's control which had to be addressed before the analysis could be done. This process involved firstly exploring the various options that could be used to solve this problem. Amongst these options were the following methods which are briefly discussed below (Du Toit & Du Toit, 2001; Mels, 2003):

- List-wise deletion of cases;
- Pair-wise deletion of cases;
- Imputation by matching;
- Multiple imputation (MI); and
- Full information Maximum Likelihood estimation (hereafter referred to as FIML)

The treatment of the missing value problem typically used as the default option in most statistical analyses is list-wise deletion of cases. The danger with this option is that the size of the sample could be dramatically reduced which could result in sampling bias (Du Toit & Du Toit, 2001). In this case, however, list wise deletion results in a loss of only 23 cases. Pair-wise deletion of cases would still be a feasible solution to the missing values problem in the item and dimensionality analysis. Pair-wise deletion, however, does not present itself as a feasible solution to the problem in the calculation of item parcels in that it would simply perpetuate the problem on the item parcel level. The most satisfactory solution probably would have been to use a multiple imputation procedure (Du Toit & Du Toit, 2001; Mels, 2003). The advantage of both the two multiple imputation procedures available in LISREL 8.54 is that estimates of missing values are derived for all the cases in the initial sample (i.e., no cases with missing values are deleted) and the data set is available for subsequent item and dimensionality analyses and the formation of item parcels (Du Toit & Du Toit, 2001; Mels, 2003). Although the Full Information Maximum Likelihood (FIML) estimation procedure is more efficient than the available multiple imputation procedures (Du Toit & Mels, 2002; Mels, 2003), no separate imputed data set is created which thus prevents item and dimensionality analyses on the imputed data as well as the calculation of item parcels. The problem, however, is that the multiple imputation procedures available in LISREL 8.54 assume that the data values are missing at random, and that the observed variables are continuous and follow a multivariate normal distribution (Du Toit & Du Toit, 2001). The individual 15FQ+ items on the other hand, should be viewed as ordinal in nature due to the three point scale on which responses are indicated (Jöreskog & Sörbom, 1996a). The data moreover, does not satisfy the assumption of multivariate normality (see paragraph 4.6.2 below).

The possibility of using imputation by matching to solve the missing value problem was also considered. Imputation by matching makes less stringent assumptions than the multiple imputation procedures. The procedure, however, still assumes that the data values are missing at random. Imputation by matching refers to a process of substituting of real values for missing values. The substitute values replaced for a case are derived from one or more cases that have a similar response pattern over a set of matching variables (Jöreskog & Sörbom, 1996b). By default, cases with missing values after imputation are eliminated. In this case it was felt that it was unlikely that imputation by matching would appreciably improve the results achieved under the list-wise deletion option.

It was consequently decided that an appropriate method to use in this study was the list-wise deletion method. This consequently meant that all cases that had items with missing values were first identified through visual inspection and then deleted, leaving only cases with complete data. Kline (2005) and Mels (2003) discuss this method as presenting itself as a possible solution of dealing with missing values, although with some reservations as it may negatively affect the sample size as indicated above. This as a result could lead to a substantially smaller sample than the original one if the missing observations are scattered across many records. However, in spite of this pitfall, the main advantage of this method is that all analyses are conducted with the same number of cases. List-wise deletion in this case resulted in an effective sample size of 241 cases.

4.3 DIMENSIONALITY ANALYSIS

The architecture of the 15FQ+ reflects the intention to construct <u>essentially</u> one-dimensional sets of 12 items that would reflect variance in each of the 16 latent variables collectively constituting the personality domain. These items are meant to operate as stimulus sets to which test takers respond with behaviour that is primarily an expression of a specific underlying latent personality variable. The items however, to varying degrees also reflect the remaining latent variables constituting the personality domain. The intention is to obtain a relatively uncontaminated measure of the specific underlying latent personality variable from the items included in the subscale through a suppressor action resulting from the random pattern of positive and negative loadings on the remaining personality factors. The latent first-order personality dimension any given set of 12 items is meant to reflect is assumed to be a uni-dimensional construct. The 15FQ+ makes provision for the fusion of the sixteen primary factors into five global factors (see Table 2.4). The 15FQ+, however, does not make provision for the fission of the primary factors into narrower, more specific sub-factors. Unrestricted principal axis factoring analyses with varimax[13] rotation were performed on each of the fifteen factor questionnaire sub-scales, each representing a facet of the multi-dimensional personality construct, to evaluate this uni-dimensionality assumption and to evaluate the success with which each item, along with the rest in that particular item set, measures the specific latent personality dimension it purports to measure. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor. The latter is probably the more realistic expectation. The likelihood that the contribution of all the remaining factors to all items of a subscale will be scree seems small.

Allen and Yen (1979) describe factor analysis as referring to a family of multivariate statistical procedure that seeks to condense a large number of observed variables (in this case items) into highly correlated groups that measure a single underlying construct. In the context of this research, the observed variables are the extent of agreement with specific behavioral statements and the factors underlying personality dimensions. Thus, Bryne (2001) discusses a factor-analytic model (EFA or CFA) as primarily focused on how, and the extent to which, the observed variables are generated by underlying latent variables or factors. The parameters characterizing the regression paths from the factors to the observed variables (i.e., factor loadings) are therefore of primary interest in this instance. Factor loading is described as the slope of the regression of an observed variable on the underlying factor that it represents (Allen & Yen, 1979). Byrne (2001) further indicates that although inter-factor relations are of interest, any regression structure amongst them is not considered in the factor-analytic model.

[13] The use of orthogonal rotation could be criticized as inappropriate. The expectation underlying the analysis is that the uni-dimensionality assumption will be corroborated either through the extraction of a single actor or through the extraction of multiple factors but with all items showing high loadings on the first factor. In the latter case rotation would be required. In the event of this happening an orthogonal solution should be more easily interpretable. The ease of interpretation does, however, come at a price in as far as an orthogonal factor structure would to some degree strain reality in as far as the primary personality factors are assumed to be correlated. .

In essence this approach assumes that each variable is a linear combination of some number of common factors and a unique factor. According to Stanek (1995, p. 9), this can be presented as follows:

$Z_j = [\Sigma]\ k(a_{jk}S_k) + a_juS_ju$

Where:

z - standardized variable,

a - factor loading

s - -common factor or factor score

j - index for variables,

k - index for factors, and

u - denotes the unique portion

The purpose of the analyses (under normal circumstances) would also be to recommend the removal or rewriting of items with inadequate factor loadings and to split heterogeneous sub-scales into two or more homogeneous subsets of items if necessary. If the latter happens, this would require the concomitant adjustments to the underlying 15FQ+ measurement model and that the dimensionality and item analyses should be repeated on the newly created subscales. However, due to the nature of the study the latter options were not feasible. The research is aimed at psychometrically evaluating the existing 15FQ+ as it is currently being used. The researcher was not commissioned to revise the current instrument. Neither does the researcher have any intellectual property claims on the instrument. The research therefore can not re-word or delete any item even if this would be indicated by various item statistics.

Spangenberg and Theron (2004) refer to Hulin, Grasgrow and Parsons (1983) who caution that the factor analysis performed here on a matrix of product moment correlations might not be the most appropriate procedure for establishing the uni-dimensionality of a subscale. This cautious view is based on the conviction that there is a danger of extracting artefact factors reflecting differences in item difficulty value, kurtosis or variance only. To counter this shortcoming, Spangenberg and Theron (2004, p. 7) cite Schepers (1992) who argues for the need to calculate the descriptive statistics for the items of each sub-scale to ascertain the possibility of multiple factors appearing as an artefact of differential item characteristics like skewness.

The Statistical Package for the Social Sciences (SPSS) 11.0 for Windows (2004) was used to perform a series of 16 exploratory factor analyses on the items comprising the subscales of the 15FQ+. A summary of the results of the factor analyses are shown in Table 4.1.

TABLE 4.1

SUMMARY OF THE RESULTS OF THE PRINCIPAL AXIS FACTOR ANALYSES

Subscale	Determinant	KMO	Bartlett χ^2	%Variance explained	No. of factors extracted
fA	,334	,668	257,682*	29,641	5
fB	,273	,683	305,126*	26,390	3
fC	,260	,764	316,813*	36,567	5
fE	,383	,692	225,979*	26,572	4
fF	,194	,734	385,998*	35,385	4
fG	,153	,778	441,410*	31,157	3
fH	,128	,803	483,852*	37,632	4
fI	,266	,675	311,439*	35,831	5
fL	,158	,732	433,322*	35,293	4
fM	,438	,646	194,228*	27,584	4
fN	,202	,724	376,023*	33,477	4
fO	,271	,683	306,833*	34,243	5
fQ1	,242	,688	333,722*	34,440	4
fQ2	,318	,683	269,625*	29,494	4
fQ3	,211	,730	366,203*	34,213	4
fQ4	,304	,722	279,724*	31,588	5

* p<0,01

A motivated account will be provided below on the manner in which the factor analysis was performed on each subscale. A more detailed account of the results obtained for each subscale will subsequently be presented.

4.3.1 EVALUATING THE FACTOR ANALYZABILITY OF THE INTER-ITEM CORRELATION MATRIX

In evaluating the factor analyzability of the inter-item correlation matrix the question is considered whether it is meaningful to search for one or more common factors underlying the observed inter-item correlation matrix. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test were used to examine the factor analyzability of the observed inter-item correlation matrix. Sricharoena and Buchenrieder (2005) describe the KMO-measure of sampling adequacy as an index expressing the ratio of the sum of the squared inter-item correlations and the squared inter-item correlations plus the sum of the squared partial inter-item correlation coefficients. This measure varies between 0 and 1 with values closer to 1.00 being considered to be better. Values approaching 1 will be obtained if the sum of the squared partial inter-item correlation coefficients approaches zero. This will happen if items reflect a common underlying factor so that when this is statistically controlled the correlations between items approach zero. Where the KMO approaches unity (at least >0,60) the correlation matrix is considered factor analyzable. With regard to the 15 FQ+, the values of KMO range between 0,646 and 0,803 which indicate that all the correlation matrices are factor analyzable.

The Bartlett test of sphericity was used to test the null hypothesis that the inter-item correlation matrix is an identity matrix in the parameter. An identity matrix is one in which all items only correlate with themselves and not with each other (i.e. all the diagonal elements are 1's and all off diagonal elements are 0's). In the case of all 16 subscales, the stated null hypothesis could be rejected which means that the correlation matrices are all factor analyzable.

To be factor analyzable the observed inter-item correlation matrix has to contain numerous sizable (r_{ij} > 0,30) and significant (p<0,05) correlations. This requirement seems to have been met by all 16 observed inter-item correlation matrices (see Appendix A)

Taken together, these results (i.e., KMO, Bartlett's test of sphericity and the magnitude and significance of the inter-item correlations) suggest that it would be meaningful to conduct factor analysis on the 16 inter-item correlation matrices.

4.3.2 FACTOR EXTRACTION METHOD

Each one of the 15FQ+ subscales were consequently factor analyzed using principal axis factor analysis. Several extraction methods have been developed to extract factors from an inter-item correlation matrix. These include amongst others, unweighted least squares, generalized least squares, maximum likelihood, principal axis factoring, principal component analysis and image factoring which are all compatible with SPSS software. Costello and Osborne (2005) mention that detailed information on the relative strengths and weaknesses of these techniques are scarce and often only available in obscure references. This may, however, be an unnecessarily harsh and extreme position. Quite accessible but still comprehensive presentations of the various possible extraction techniques are available in for example Nunnally, (1968) and in Tabachnick and Fidell (1996). The important decision is the choice between principle component analysis and factor analysis. For this research, factor analysis was chosen as it seeks the least number of factors which can account for common variance shared by the observed variables in the set of variables, i.e. the correlations between observed variables. The objective of the dimensionality analysis is to evaluate the assumption that a single underlying personality factor can satisfactorily account for the variance shared by the items in a subscale. On the other hand, principal component analysis, which could be an alternative method, does not differentiate between common and unique variance as it endeavours to determine factors which account for total (unique and common) variance in a subset of variables (Fabrigar, Wegener, MacCallum & Strahan, 1999). This explains the choice of factor analysis over principle component analysis which better serves the research's objective of evaluating whether the items comprising each subscale of the 15FQ+ only reflect a single underlying personality factor. The choice of a specific factor analytic extraction method is less critical (Tabachnick & Fidell, 1996). The principal axis factoring method was specifically chosen since it generally provides a factor decomposition that is easily interpretable (Costello & Osborne, 2005**;** Fabrigar, Wegener, MacCallum & Strahan, 1999)**.**

4.3.3 DECISION ON THE NUMBER OF FACTORS TO EXTRACT

A perfect explanation for the observed inter-item correlation matrix could be obtained by assuming that the number of factors underlying the item set is equal to the number of variables being analyzed. Generally, the more factors are extracted the better the fit between the observed and reproduced correlation matrices (Tabachnick & Fidell, 2001). However, the more factors are extracted the less parsimonious the factor structure becomes (Tabachnick & Fidell, 2001), hence the need to decide on the number of factors which are meaningful and worthy of being retained for rotation and interpretation. The retained factors should satisfactorily account for the co-variance between the items in any particular scale. In discussing the number of factors to be extracted, Fabrigar, Wegener, MacCallum and Strahan (1999) suggest that a number of indicators should be used simultaneously to avoid having to rely on one method of determination. This as a result, means that the determination of the number of factors to be extracted should be guided by theory, but also informed by running the analysis extracting a different number of factors and assessing which ones yield the most interpretable results. To decide on the appropriate number of factors to extract, the eigenvalue- greater-than-one criterion and the scree test (Fabrigar, Wegener MacCallum & Strahan, 1999) were used. These two methods will be discussed below.

4.3.3.1 Eigenvalue-greater-than-one criterion

This method is also commonly known as the Kaiser criterion (Kaiser, 1960). Eigenvalue or latent root is described as the amount of variance accounted for by a factor and is the sum of the squared factor loadings of the observed variables in a column, that is, the sum of the variances for each variable (Hardy & Bryman, 2004). Taylor (2005) presents the criterion of eigenvalues greater than 1,00 as being attributable to Guttman (1954), adapted by Kaiser in 1960. Computing eigenvalues for the correlation matrix is one of the approaches often used to determine the number of factors to extract. This criterion ignores factors that have eigenvalues less than 1,00 as they are viewed as contributing little to the explanation of variances in the variables and may be ignored as redundant. According to this criterion, only factors with eigenvalues greater than 1,00 are retained. Taylor (2005) cautions that the cut-off point at 1,00 should be seen as somewhat arbitrary. The problem is that there could be factors which fall close to either side of this value and therefore they would account for almost exactly the same amount of variance. Nonetheless only those that fall above the cut-off would be retained. For example, according to this criterion, a factor with an eigenvalue of 1,01 would be retained as a major common factor whereas one with an eigenvalue of ,99 could be rejected although the difference between these two is insignificant. This problem would apply to any critical eigenvalue cut-off. Hence this is one of the reasons for using multiple procedures for determining the number of factors to be extracted. To remedy this shortcoming Hardy and Bryman (2004) suggest that it would be worthwhile extracting both more and fewer factors than the number suggested by the eigenvalue-greater-than-one rule to assess whether these factors, when rotated, are meaningful. To reiterate this viewpoint, these scholars acknowledge that while the Kaiser criterion is the default in SPSS and most of the computer programs, it is not recommended that it should be used as the sole cut-off criterion for estimating the number of factors underlying the observed correlation matrix.

4.3.3.2 Scree test

Cattell (1966) describes the scree test as an examination of the graph of plotted eigenvalues associated with each of the factors and then looking for a “break” between the factors with relatively large eigenvalues and those with small eigenvalues. The word scree derives its meaning from the rubble at the bottom of a cliff (Taylor, 2005). In this context, it refers to the factors that could be discarded after a substantial drop in the eigenvalues. Taylor (2005) contends that the number of factors to be extracted is shown by the number of factors before the drop or break in the scree plot. Hence, the factors that appear before the break (or elbow) are assumed to be meaningful and are retained for rotation; and those appearing after the break (elbow) are assumed to be unimportant and are not retained. This method too has been criticized by scholars like Hayton and Scarpello (2004) who view it as laden with subjectivity and ambiguity, especially where there are either no clear breaks or two or more apparent breaks, as well as in situations where breaks are less likely in particular with smaller sample sizes and when the ratio of variables to factors is low.

4.3.4 ROTATION OF EXTRACTED FACTORS

Once the number of factors to be extracted has been identified, they are then rotated to extract meaning from them. According to Powell and Peng (1989) factor analytic techniques use rotation of the extracted factors to make the factor loadings more interpretable by reorienting them. As is true with the extraction methods, there are a variety of choices. Amongst them are the following: varimax, quartimax and equamax, which are commonly available orthogonal methods of rotation, and direct oblimin, quartimin and promax, which are oblique methods of rotation (Costello & Osborne, 2005; Tabachnick & Fidell, 2001). Given the design intention of the developers of the 15FQ+ (reflected in the 15FQ+ scoring key) that items written to reflect a specific first-order personality factor will only reflect that specific factor and none of the other fifteen personality dimensions, it was expected that the exploratory factor analysis performed on each of the subscales would result in the extraction of a single underlying factor for each subscale[14]. Under these conditions the rotation of the extracted factor structure would not be required or meaningful. In selecting the factor rotation method, this study chose an orthogonal rotation method which would ease interpretation and reporting. The study chose to use varimax rotation (which is a default setting in almost all statistical packages) which attempts to minimize the complexity of variables and to simplify factors by maximizing the sum of variances of factor loadings within factors. Varimax rotation attempts to drive small factor loadings smaller and high

[14] The low road scenario expectation was that the items might be somewhat noisy and hence would have relatively low to modest loadings on a single factor.

factor loadings higher (Tabachnick & Fidell, 2001). The rationale for using this method was that it generally produces more easily interpretable results since the items that load on a factor become clearer. But Costello and Osborne (2005) warn that using orthogonal rotation could result in the loss of valuable information if the factors are correlated as could be the case if meaningful factor fission would occur within the subscales of the 15FQ+.

All things considered, oblique rotation would probably have been a more methodologically responsible option to have chosen since it would have catered for the possibility that the extracted factors could be correlated. This option is however not without problems as [a] it is more complex than orthogonal rotation in that not only do the correlations between factors have to be considered in the interpretation of the results, but it also needs to be kept in mind that factors can no longer be interpreted independent of each other due the overlapping variance, and [b] it generates a structure matrix and a pattern matrix, both of which have to be considered in evaluating the results. In addition, Rummel (1970) argues that the analytical techniques for oblique rotation are varied and technically difficult. Hence it is often not the preferred method used for factor rotation. In the final analysis however, complexity and difficulty should not have been the decisive factors that governed the choice of rotation technique.

4.3.5 DIFFERENTIAL SKEWNESS

Differential item skewness could result in the extraction of artefact factors reflecting differences in skewness (Schepers, 1992). A skewness statistic was therefore calculated for each item and its significance evaluated. The majority of items followed a significantly ($p<0,05$) negatively skewed and leptokurtic distribution (See Appendix A)**.** Due to the absence of positively skewed items and the consistency in distributional form across items this did, however, not result in the emergence of artefact factors.

4.3.6 DISCUSSION OF THE DIMENSIONALITY OF THE INDIVIDUAL 15FQ+ SCALES

As discussed above, unrestricted principal axis factor analysis with varimax (with Kaiser Normalisation) rotation was performed on each one of the subscales aimed at confirming their uni-dimensionality. As has already been explained above, the eigenvalue greater than unity rule of thumb and the scree plot were used to determine the number of factors to be extracted. A summary of results is presented in Tables 4.2a and 4.2b to Tables 4.17a and 4.17b below for the different subscales.

4.3.6.1 Dimensionality analysis: Factor A

In the case of factor A, in investigating the uni-dimensionality assumption that the12 items comprising the Aloof-Empathic subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need five factors to be able to explain the observed correlations between the items of subscale A. Five factors have eigenvalues greater than unity. The scree plot also suggests the extraction of five factors. The result obtained for the factor A subscale are problematic, not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather because all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument, one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether this outcome points to a meaningful fission of the Aloof-Empathic factor. To examine this possibility one would need to scrutinize the item loadings of the items on each of the five extracted factors. From the rotated factor matrix shown in Table 4.2a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Aloof-Empathic factor. For factor 1, there are four items (Q1, Q77, Q151 and Q176) with loadings greater than 0,30. Three items (Q27, Q52 and Q77) load on factor 2. Factor 3 has one item (Q101) with a loading greater than 0,50 (0,631) and factor 4 has one item (Q2) with a loading greater than 0,50 (0,564). Two items (Q51 and Q76) load on factor 5. One item (Q26) did not load on any of the five extracted factors. One item (Q77) showed itself as a complex item simultaneously loading on two factors.

In spite of the above findings, the researcher nonetheless went ahead to fit the measurement model by assuming that the 12 factor A items were all indicators of a single underlying factor as they are used according to the scoring key. The objective of the subsequent confirmatory factor analysis is to evaluate the fit of the measurement model reflecting the manner in which the 15FQ+ is currently being used. The intention is to do so by combining the items of each subscale into two linear composites or item parcels. To examine how well the 12 factor A items represent the single underlying factor the item parcels are meant to represent, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.2b.

TABLE 4.2a

ROTATED FACTOR MATRIX FOR THE 5-FACTOR SOLUTION (FACTOR A)

	Factor				
	1	2	3	4	5
15FQ+_FA_Q1	**,582**	,228	-,020	-,141	-,074
15FQ+_FA_Q2	-,042	-,013	-,135	**,564**	,059
15FQ+_FA_Q26	-,062	,052	,121	,080	,208
15FQ+_FA_Q27	,107	**,589**	-,047	,033	,117
15FQ+_FA_Q51	,035	,145	-,076	-,078	**,436**
15FQ+_FA_Q52	,134	**,430**	,252	,013	,090
15FQ+_FA_Q76	,264	-,053	,253	,217	**,321**
15FQ+_FA_Q77	**,515**	**,474**	,078	-,038	,274
15FQ+_FA_Q101	,092	,041	**,631**	-,165	,058
15FQ+_FA_Q126	,239	-,092	-,043	-,233	,082
15FQ+_FA_Q151	**,424**	,066	,104	-,010	,023
15FQ+_FA_Q176	**,343**	,172	,279	,022	-,084

a. Rotation converged in 13 iterations.

TABLE 4.2b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR A)

	Factor
	1
15FQ+_FA_Q1	,494
15FQ+_FA_Q2	-,100
15FQ+_FA_Q26	,068
15FQ+_FA_Q27	,390
15FQ+_FA_Q51	,188
15FQ+_FA_Q52	,434
15FQ+_FA_Q76	,267
15FQ+_FA_Q77	**,755**
15FQ+_FA_Q101	,262
15FQ+_FA_Q126	,136
15FQ+_FA_Q151	,377
15FQ+_FA_Q176	,399

1 factors extracted. 9 iterations required.

The loadings of the 12 items on the single extracted factor, earmarked by the scoring key to reflect factor A, are generally low. Only one item (Q77) has a loading higher than 0,50 (six items have loadings higher than 0,30). The single factor therefore explains less than 25% of the variance in each of the remaining eleven items. To combine the 12 factor A items into two linear composites to represent factor A in the measurement model is therefore not really justified. Neither, however, do the results depicted in Table 4.2a and Table 4.2b really justify combining the item scores on these 12 items into a measure of factor A.

The residuals correlations (the difference between the observed and reproduced correlations) were computed for both the 5-factor and the 1-factor solution. For the 5-factor solution a small percentage (1,0%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a very credible explanation for the observed inter-item correlation matrix. The five extracted factors explained 58,43% of the total sub-scale variance in the initial solution but only 29,641% of the observed variance in the extracted solution[15]. For the 1-factor solution a large percentage (51,0%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a credible explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 19,892% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Aloof-Empathic subscale reflect one indivisible underlying theme.

4.3.6.2 Dimensionality analysis: Factor B

In the case of factor B, in investigating the uni-dimensionality assumption that the12 items comprising the Intellectance subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need three factors to explain the observed correlations between the 12 items of subscale B. Three factors have eigenvalues greater than unity. The scree plot also suggests the extraction of three factors. The result obtained for the factor B subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations but rather the fact

[15] To calculate the proportion of variance in the solution accounted for by a factor the sum of the squared factor loadings for the factor (i.e., summed across items) would have to be divided by the sum of the communalities (or the sum of the squared factor loadings summed across factors).

that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument, one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether this outcome points to a meaningful fission of the Intellectance factor. To examine this possibility the item loadings of the items on each one of the three extracted factors were examined. From the rotated factor matrix shown in Table 4.3a, no clear, interpretable pattern of loadings emerge that would suggest that the Intellectance factor can be meaningfully split into three sub-factors.

TABLE 4.3a

ROTATED FACTOR MATRIX FOR THE 3-FACTOR SOLUTION (FACTOR B)

	Factor		
	1	2	3
15FQ+_FB_Q3	**,534**	,138	-,016
15FQ+_FB_Q28	**,497**	-,005	,083
15FQ+_FB_Q53	-,050	**,660**	,044
15FQ+_FB_Q78	**,477**	-,041	,281
15FQ+_FB_Q102	,154	,126	**,318**
15FQ+_FB_Q103	,270	-,184	,026
15FQ+_FB_Q127	,072	,028	**,552**
15FQ+_FB_Q128	**,500**	-,180	,052
15FQ+_FB_Q152	,011	,054	**,374**
15FQ+_FB_Q153	**,420**	,234	,319
15FQ+_FB_Q177	-,036	**,557**	,172
15FQ+_FB_Q178	**,311**	,283	,151

a. Rotation converged in 5 iterations.

For factor 1, there are six items (Q3, Q28, Q78, Q128, Q153 and Q178) with loadings greater than 0,30. Two items (Q53 and Q177) that loaded on factor 2 and factor 3 has four items (Q102, Q127, Q152 and Q177) with loadings greater than 0,30. One item (Q103) did not load on any of the three extracted factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the three factors. It therefore is difficult to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

To examine how well the 12 factor B items represent a single underlying factor if a single underlying factor would be assumed, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.3b.

TABLE 4.3b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR B)

	Factor 1
15FQ+_FB_Q3	,449
15FQ+_FB_Q28	,449
15FQ+_FB_Q53	,119
15FQ+_FB_Q78	**,526**
15FQ+_FB_Q102	,315
15FQ+_FB_Q103	,186
15FQ+_FB_Q127	,307
15FQ+_FB_Q128	,366
15FQ+_FB_Q152	,201
15FQ+_FB_Q153	**,581**
15FQ+_FB_Q177	,166
15FQ+_FB_Q178	,409

1 factors extracted. 6 iterations required.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor B. Only two items (Q78 and Q153) have loadings higher than 0,50 (eight items have loadings higher than 0,30). The single factor therefore explains less than 25% of the variance in each of the remaining ten items. To combine the 12 factor B items into two linear composites to represent this factor in the measurement model is therefore somewhat questionable. Neither, however, do the results depicted in Table 4.3a and Table 4.3b really justify combining the item scores on these 12 items into a measure of factor B.

The residuals correlations were computed for both the 3-factor and the 1-factor solution. For the 3-factor solution a small percentage (12%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a reasonably credible explanation for the observed inter-item correlation matrix. The three extracted factors explained 44,182 % of the total sub-scale variance in the initial solution but only 26,390% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (53%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a credible explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 20,213% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Intellectance subscale reflect one indivisible underlying theme.

4.3.6.3 Dimensionality analysis: Factor C

In the case of factor C, in investigating the uni-dimensionality assumption that the12 items comprising the Affected by feelings-Emotionally stable subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need five factors to explain the observed correlations between the 12 items of subscale C. Five factors have eigenvalues greater than unity. The scree plot tends to be somewhat ambiguous in that it could be interpreted to suggest the extraction of a single factor if interpreted conservatively or the extraction of two or five factors. The result obtained for the factor C subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the five factor solution points to a meaningful splitting of the Affected by feelings-Emotionally stable factor. To examine this possibility the item loadings of the items on each of the five extracted factors were examined. From the rotated factor matrix shown in Table 4.4a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Affected by feelings-Emotionally stable factor. For factor 1, there are four items (Q4, Q55, Q104, and Q129) with loadings greater than 0,30. Two items (Q79 and Q179) load on factor 2 and factor 3 has one item (Q29) with a loading greater than 0,30. Factor four has three items (Q5, Q30 and Q80) with loadings greater 0,30 and factor five has two items (Q129 and Q154) with loadings greater than 0,30. One item (Q54) did not load on any of the five extracted factors.

TABLE 4.4a

ROTATED FACTOR MATRIX FOR THE 5-FACTOR SOLUTION (FACTOR C)

	Factor				
	1	2	3	4	5
15FQ+_FC_Q4	**,358**	,202	,077	,157	-,041
15FQ+_FC_Q5	,203	-,020	-,099	**,505**	,057
15FQ+_FC_Q29	,267	,101	**,886**	,033	,119
15FQ+_FC_Q30	-,002	,085	,077	**,379**	-,001
15FQ+_FC_Q54	,259	,140	-,138	,247	,064
15FQ+_FC_Q55	**,546**	,103	,100	,150	,166
15FQ+_FC_Q79	,211	**,311**	,077	,136	,176
15FQ+_FC_Q80	,155	,127	,059	**,439**	,258
15FQ+_FC_Q104	**,519**	,065	,151	,071	,166
15FQ+_FC_Q129	**,344**	,074	,068	-,101	**,453**
15FQ+_FC_Q154	,052	,118	,043	,226	**,553**
15FQ+_FC_Q179	,151	**,839**	,041	,095	,116

a Rotation converged in 6 iterations.

No meaningful underlying theme could be found in the wording of the items loading on each of the five factors. It is therefore not possible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed to the use of an inappropriate rotation technique.

To examine how well the 12 factor C items represent a single underlying factor if a single underlying factor would be assumed, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.4b.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor C. Only one item (Q55) has a loading higher than 0,50 (eleven items load 0,30 or higher on the single extracted factor). The single factor therefore explains less than 25% of the variance in each of the remaining eleven items. To combine the 12 factor C items into two linear composites to represent this factor in the measurement model is therefore not really justified. Neither, however, do the results depicted in Table 4.4a and Table 4.4b really justify combining the item scores on these 12 items into a measure of factor C.

TABLE 4.4b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR C)

	Factor
	1
15FQ+_FC_Q4	,387
15FQ+_FC_Q29	,401
15FQ+_FC_Q30	,207
15FQ+_FC_Q5	,301
15FQ+_FC_Q54	,318
15FQ+_FC_Q55	**,557**
15FQ+_FC_Q79	,436
15FQ+_FC_Q80	,454
15FQ+_FC_Q104	,498
15FQ+_FC_Q129	,401
15FQ+_FC_Q154	,394
15FQ+_FC_Q179	,462

1 factor extracted. 5 iterations required.

The residuals correlations were computed for both the 5-factor and the 1-factor solution. For the 5-factor solution all non-redundant residuals had absolute values less than 0,05 thus suggesting that the rotated factor solution provides an extremely convincing explanation for the observed inter-item correlation matrix. The five extracted factors explained 59,95% of the total sub-scale variance in the initial solution but only 36,567% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (40%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a convincing explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 23,625% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix. The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Affected by feelings-Emotionally stable subscale reflect one indivisible underlying theme.

4.3.6.4 Dimensionality analysis: Factor E

In the case of factor E, in investigating the uni-dimensionality assumption that the 12 items comprising the Accommodating-Dominant subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need four factors to explain the observed correlations between the 12 items of subscale E. Four factors have eigenvalues greater than unity. The scree plot also suggests the extraction of four factors albeit not very convincingly. The scree plot could also be interpreted to indicate the extraction of a single factor. The result obtained for the factor E subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether this outcome points to a meaningful fission of the Accommodating-Dominant factor. To examine this possibility the loadings of the items on each of the four extracted factors were scrutinized. From the rotated factor matrix shown in Table 4.5a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Accommodating-Dominant factor.

TABLE 4.5a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR E)

	Factor			
	1	2	3	4
15FQ+_FE_Q6	**,331**	,020	,297	,097
15FQ+_FE_Q31	-,014	,050	**,364**	,191
15FQ+_FE_Q56	,172	-,113	,111	**,457**
15FQ+_FE_Q81	,219	,106	,164	,241
15FQ+_FE_Q105	,009	**,834**	,205	,037
15FQ+_FE_Q106	-,011	,122	,078	**,316**
15FQ+_FE_Q130	,199	,027	**,487**	,078
15FQ+_FE_Q131	**,558**	-,105	,122	,190
15FQ+_FE_Q155	**,423**	-,063	,249	,120
15FQ+_FE_Q156	**,601**	,114	-,034	,044
15FQ+_FE_Q180	,054	,092	**,314**	,039
15FQ+_FE_Q181	,115	-,022	,050	**,348**

a. Rotation converged in 5 iterations.

For factor 1, there are four items (Q6, Q131, Q155 and Q156) with loadings greater than 0,30. One item (Q105) loads on factor 2. Factors three and four have three items each (Q31, Q130, and Q180; and Q56, Q106 and Q181) respectively with loadings greater than 0,30. One item (Q81) did not load on any of the five extracted factors. No meaningful underlying theme could be found in the wording of the items loading on each of the four factors. It is therefore impossible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

To examine how well the 12 factor E items represent a single underlying factor if a single underlying factor would be assumed, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.5b.

TABLE 4.5b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR E)

	Factor
	1
15FQ+_FE_Q6	,453
15FQ+_FE_Q131	,259
15FQ+_FE_Q56	,355
15FQ+_FE_Q81	,370
15FQ+_FE_Q105	,148
15FQ+_FE_Q106	,181
15FQ+_FE_Q130	,416
15FQ+_FE_Q131	**,518**
15FQ+_FE_Q155	,494
15FQ+_FE_Q156	,402
15FQ+_FE_Q180	,225
15FQ+_FE_Q181	,258

a. 1 factor extracted. 4 iterations required.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor E. Only one item (Q131) has a loading higher than 0,50 (seven items had loadings exceeding 0,30). The single factor therefore explains less than 25% of the variance in each of the remaining eleven items. To combine the 12 factor items into two linear composites to represent this factor in the measurement model is therefore difficult to justify. Neither, however, do the results depicted in Table 4.3a and Table 4.3b really justify combining the item scores on these 12 items to derive an observed score measure of factor E.

The residuals correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (7%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a convincing explanation for the observed inter-item correlation matrix. The four extracted factors explained 48,817 % of the total sub-scale variance in the initial solution but only 26,572% of the observed variance in the extracted solution. For the 1-factor solution a reasonably large percentage (39%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a convincing explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 19,826% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Accommodating-Dominant subscale reflect one indivisible underlying theme.

4.3.6.5 Dimensionality analysis: Factor F

In the case of factor F, in investigating the uni-dimensionality assumption that the12 items comprising the Sober Serious-Enthusiastic subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need four factors to explain the observed correlations between the 12 items of subscale F. Four factors have eigenvalues greater than unity. The scree plot is somewhat ambiguous in its suggestion on the appropriate number of factors to extract. The scree plot could be interpreted to extract two factors, four factors or five factors. The result obtained for the factor F subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the extraction of more than a single factor points to a meaningful set of sub-factors underlying the Sober Serious-Enthusiastic factor. To examine this possibility one would need to scrutinize the item loadings of the items on each one of the four extracted factors. From the rotated factor matrix shown in Table 4.6a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Sober Serious-Enthusiastic factor. For factor 1, there are three items (Q32, Q82, and Q182) with loadings greater than 0,30. Six items (Q7, Q8, Q58, Q107, Q132 and Q157) load on factor 2 with loadings greater 0,30. Factor three has three items (Q8, Q57, and Q182) with loadings greater than 0,30. Factor four has only one item (Q83) with a loading greater than 0,30. One item (Q33) did not load on any of the four extracted factors. Two items (Q8 and Q182) showed themselves as complex items each simultaneously loading on two factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the four factors. It therefore is not possible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

TABLE 4.6a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR F)

	Factor			
	1	2	3	4
15FQ+_FF_Q7	,070	**,380**	,171	,264
15FQ+_FF_Q8	,226	**,337**	**,535**	,108
15FQ+_FF_Q32	**,478**	,138	,046	,047
15FQ+_FF_Q33	,002	,054	,079	,173
15FQ+_FF_Q57	,057	,036	**,479**	,070
15FQ+_FF_Q58	,157	**,339**	,263	,060
15FQ+_FF_Q82	**,642**	,076	,045	-,013
15FQ+_FF_Q83	,071	,039	-,024	**,839**
15FQ+_FF_Q107	,115	**,498**	-,012	,022
15FQ+_FF_Q132	,229	**,551**	,009	,139
15FQ+_FF_Q157	-,118	**,481**	,211	,009
15FQ+_FF_Q182	**,708**	,034	**,486**	,116

a. Rotation converged in 6 iterations.

To examine how well the 12 factor F items represent an assumed single underlying factor , the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.6b.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor F. Only two items (the two complex items, Q8 and Q182) have loadings higher than 0,50 (nine items load higher than 0,30 on the single extracted factor). The single factor therefore explains less than 25% of the variance in each of the remaining ten items. To combine the 12 factor F items into two linear composites to represent this factor in the measurement model is therefore not really justified. Neither, however, do the results depicted in Table 4.6a and Table 4.6b really justify combining the item scores on these 12 items into a measure of factor F as would be the case when using the 15FQ$^+$ on a Black South African manager.

TABLE 4.6b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR F)

	Factor 1
15FQ+_Ff_Q7	,416
15FQ+_FF_Q8	**,623**
15FQ+_FF_Q32	,398
15FQ+_FF_Q33	,124
15FQ+_FF_Q57	,301
15FQ+_FF_Q58	,449
15FQ+_FF_Q82	,414
15FQ+_FF_Q83	,226
15FQ+_FF_Q107	,342
15FQ+_FF_Q132	,478
15FQ+_FF_Q157	,293
15FQ+_FF_Q182	**,630**

a. 1 factor extracted. 5 iterations required.

The residuals correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (4%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a plausible explanation for the observed inter-item correlation matrix. The four extracted factors explained 54,455% of the total sub-scale variance in the initial solution but only 35,385% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (53%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a convincing explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 23,634% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation for the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Sober Serious - Enthusiastic subscale reflect one indivisible underlying theme.

4.3.6.6 Dimensionality analysis: Factor G

In the case of factor G, in investigating the uni-dimensionality assumption that the12 items comprising the Expedient-Conscientious subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need three factors to explain the observed correlations between the 12 items of subscale G. Three factors have eigenvalues greater than unity. The scree plot in contrast suggests the extraction of two factors. The result obtained for the factor G subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument, one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether this outcome points to a meaningful fission of the Sober Serious-Enthusiastic factor. To examine this possibility the item loadings of the items on each of the three extracted factors were examined. From the rotated factor matrix shown in Table 4.7a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Expedient-Conscientious factor. For factor 1, there are seven items (Q9, Q34, Q59, Q108, Q109, Q133 and Q184) with loadings greater than 0,30. Three items (Q34, Q133, and Q158) load on factor 2 with loadings greater 0,30. Factor three has two items (Q134 and Q184) with loadings greater than 0,30. Three items (Q84, Q159 and Q183) did not load on any of the three extracted factors. Three items (Q34, Q133 and Q184) showed themselves as complex items each simultaneously loading two factors.

TABLE 4.7a

ROTATED FACTOR MATRIX FOR THE 3-FACTOR SOLUTION (FACTOR G)

	Factor		
	1	2	3
15FQ+_FG_Q9	**,608**	,130	,064
15FQ+_FG_Q34	**,340**	**,343**	,269
15FQ+_FG_Q59	**,439**	,237	-,005
15FQ+_FG_Q84	,263	,091	-,080
15FQ+_FG_Q108	**,369**	-,003	,152
15FQ+_FG_Q109	**,459**	,100	,103
15FQ+_FG_Q133	**,406**	**,485**	,244
15FQ+_FG_Q134	,023	,070	**,784**
15FQ+_FG_Q158	,199	**,704**	,036
15FQ+_FG_Q159	,262	,133	-,052
15FQ+_FG_Q183	,029	,293	,294
15FQ+_FG_Q184	**,550**	,218	**,305**

a. Rotation converged in 5 iterations.

No meaningful underlying theme could be found in the wording of the items loading on each of the three factors. It is therefore impossible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed to the use of an inappropriate rotation technique.

To examine how well the 12 factor G items represent an assumed single underlying factor , the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.7b.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor G. Only four items (Q9, Q34, Q133 and Q184) have loadings higher than 0,50 (eight items load higher than 0,30 on the single extracted factor). The single factor therefore explains more than 25% of the variance in only four items. To combine the 12 factor G items into two linear composites to represent this factor in the measurement model when most of the items reflect so little variance in the factor they are meant to represent, is therefore not really justified. By the same token, however, the results depicted in Table 4.7a and Table 4.7b do not really justify combining the item scores on these 12 items to obtain an observed score for factor G.

TABLE 4.7b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR G)

	Factor 1
15FQ+_FG_Q9	**,540**
15FQ+_FG_Q34	**,549**
15FQ+_FG_Q59	,456
15FQ+_FG_Q84	,218
15FQ+_FG_Q108	,330
15FQ+_FG_Q109	,439
15FQ+_FG_Q133	**,666**
15FQ+_FG_Q134	,288
15FQ+_FG_Q158	,498
15FQ+_FG_Q159	,253
15FQ+_FG_Q183	,285
15FQ+_FG_Q184	**,649**

a. 1 factor extracted. 5 iterations required.

The residual correlations were computed for both the 3-factor and the 1-factor solution. For the 3-factor solution a moderate percentage (21%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution does provide a reasonably credible explanation for the observed inter-item correlation matrix. The three extracted factors explained 46,485% of the total sub-scale variance in the initial solution but only 31,157% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (53%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a convincing explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 26,726 % of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Expedient - Conscientious subscale reflect one indivisible underlying theme.

4.3.6.7 Dimensionality analysis: Factor H

In the case of factor H, in investigating the uni-dimensionality assumption that the 12 items comprising the Retiring-Social Bold subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need four factors to satisfactorily explain the observed correlations between the 12 items of subscale H. Four factors have eigenvalues greater than unity. The scree plot in contrast suggests the extraction of a single factor. The result obtained for the factor H subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument, one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the extraction of four factors would constitute a meaningful fission of the Retiring-Social Bold factor. To examine this question the item loadings of the items on each of the four extracted factors were examined. From the rotated factor matrix shown in Table 4.8a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Retiring-Social Bold factor.

TABLE 4.8a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR H)

	Factor			
	1	2	3	4
15FQ+_FH_Q10	**,371**	,094	,249	,295
15FQ+_FH_Q11	,215	,086	**,564**	,109
15FQ+_FH_Q35	,089	,157	**,711**	,169
15FQ+_FH_Q36	**,711**	,116	,185	,129
15FQ+_FH_Q60	,161	,260	,202	,085
15FQ+_FH_ Q61	,078	,098	,121	**,573**
15FQ+_FH_Q85	**,678**	,222	,101	,117
15FQ+_FH_Q86	,219	**,319**	,188	,122
15FQ+_FH_Q110	,102	**,320**	,230	,041
15FQ+_FH_Q135	,217	,294	,111	**,530**
15FQ+_FH_Q160	,150	**,349**	,163	,214
15FQ+_FH_Q185	,055	**,794**	-,049	,152

a. Rotation converged in 5 iterations.

For factor 1, there are three items (Q10, Q36, and Q85) with loadings greater than 0,30. Four items (Q86, Q110, Q160 and Q185) load on factor 2 with loadings greater 0,30. Factor three has two items (Q11 and Q35) with loadings greater than 0,30. Factor four has two items (Q61 and Q135) with loadings greater than 0,30. One item (Q60) did not load on any of the four extracted factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the three factors. No meaningful label could therefore be assigned to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed to the use of an inappropriate rotation technique.

To examine how well the 12 factor H items represent a single underlying factor if a single underlying factor would be assumed, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.8b.

TABLE 4.8b
FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR H)

	Factor 1
15FQ+_FH_Q10	**,516**
15FQ+_FH_Q11	**,568**
15FQ+_FH_Q35	**,501**
15FQ+_FH_Q36	**,575**
15FQ+_FH_Q60	,367
15FQ+_FH_Q61	,381
15FQ+_FH_Q85	**,572**
15FQ+_FH_Q86	,442
15FQ+_FH_Q110	,353
15FQ+_FH_Q135	**,547**
15FQ+_FH_Q160	,442
15FQ+_FH_Q185	,415

a. 1 factor extracted. 4 iterations required.

The loadings of the 12 items earmarked by the scoring key to reflect factor H on the single extracted factor are generally moderate. Six items (Q10, Q11, Q35, Q36, Q85, and Q135) have loadings higher than 0,50 (all twelve items load 0,30 or higher on the single factor). The single factor therefore explains more than 25% of the variance in six of the twelve items. To combine the 12 factor H items into two linear composites to represent this factor in the measurement model is therefore to some degree justified. By the same token the results depicted in Table 4.8a and Table 4.8b do to some degree justify combining the item scores on these 12 items to obtain an observed score for factor H.

The residuals correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (1%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a credible explanation for the observed inter-item correlation matrix. The four extracted factors explained 56,024% of the total sub-scale variance in the initial solution but only 37,632% of the observed variance in the extracted solution. For the 1-factor solution a moderately large percentage (33%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not really provide a plausible explanation for the observed inter-item correlation matrix. This erodes confidence in the foregoing conclusion that the combination of the 12 factor H items into two linear composites to represent this factor in the measurement model is to some degree justified. The one extracted factor accounted for 28,499 % of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Retiring - Social Bold factor subscale reflect one indivisible underlying theme.

4.3.6.8 Dimensionality analysis: Factor I

In the case of factor I, in investigating the uni-dimensionality assumption that the12 items comprising the Hard-headed–Tender-minded subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need five factors to explain the observed correlations between the 12 items of subscale I. Five factors have eigenvalues greater than unity. The scree plot in contrast suggests the extraction of a single factor. The result obtained for the factor I subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the extraction of five factors constitutes a meaningful division of the Hard-headed–Tender-minded factor. To examine this possibility the loadings of the items on each one of the five extracted factors were examined. The rotated factor matrix shown in Table 4.9a, would suggest that no meaningful fission of the Hard-headed–Tender-minded factor is possible since no clear, interpretable pattern of loadings emerged. For factor 1, there are four items (Q12, Q62, Q87 and Q136) with loadings greater than 0,30. Two items (Q111 and Q162) load on factor 2 with loadings greater 0,30. Factors three and four have two items each (Q37 and Q137; and Q112 and Q186) respectively with loadings greater than 0,30. Factor five has one item (Q161) with a loading greater than 0,30. One item (Q187) did not load on any of the five extracted factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the five factors. It therefore is not possible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

TABLE 4.9a

ROTATED FACTOR MATRIX FOR THE 5-FACTOR SOLUTION (FACTOR I)

	Factor				
	1	2	3	4	5
15FQ+_FI_Q12	**,394**	,102	,155	,188	,010
15FQ+_FI_Q37	,179	,066	**,687**	,069	-,026
15FQ+_FI_Q62	**,570**	,077	,034	,135	,140
15FQ+_FI_Q87	**,468**	-,019	,151	-,001	,140
15FQ+_FI_Q111	,013	**,848**	,181	,154	-,022
15FQ+_FI_Q112	,093	,156	,060	**,502**	,093
15FQ+_FI_Q136	**,474**	,094	,015	-,032	-,080
15FQ+_FI_Q137	,066	,146	**,594**	,173	,161
15FQ+_FI_Q161	,097	,106	,087	,020	**,722**
15FQ+_FI_Q162	,178	**,456**	,040	,033	,142
15FQ+_FI_Q186	,011	-,006	,080	**,456**	-,049
15FQ+_FI_Q187	,224	,044	,204	,236	,038

a. Rotation converged in 5 iterations.

To examine how well the 12 factor I items represent an assumed single underlying factor , the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.9b.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor I. None of the 12 items had loadings higher than 0,50 (nine items load higher than 0,30 on the single extracted factor). The single factor therefore explains less than 25% of the variance in each of the remaining eleven items. To combine the 12 factor I items into two linear composites to represent this factor in the measurement model is therefore not really justified. Neither, however, do the results depicted in Table 4.9a and Table 4.9b really justify combining the item scores on these 12 items into a measure of factor I.

TABLE 4.9b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR I)

	Factor
	1
15FQ+_FI_Q12	,445
15FQ+_FI_Q37	,466
15FQ+_FI_Q62	,441
15FQ+_FI_Q87	,370
15FQ+_FI_Q111	,418
15FQ+_FI_Q112	,348
15FQ+_FI_Q136	,281
15FQ+_FI_Q137	,496
15FQ+_FI_Q161	,272
15FQ+_FI_Q162	,367
15FQ+_FI_Q186	,193
15FQ+_FI_Q187	,374

a. 1 factor extracted. 4 iterations required.

The residuals correlations were computed for both the 5-factor and the 1-factor solution. For the 5-factor solution a small percentage (6%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a plausible explanation for the observed inter-item correlation matrix. The five extracted factors explained 60,130% of the total sub-scale variance in the initial solution but only 35,831% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (43%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a credible explanation for the observed inter-item correlation matrix. The single extracted factor accounted for 21,54% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Hard-headed–Tender-minded factor subscale reflect one indivisible underlying theme.

4.3.6.9 Dimensionality analysis: Factor L

The investigating of the uni-dimensionality assumption that the 12 items comprising the Trusting-Suspicious subscale all reflect a single underlying personality factor indicates that four factors are required to satisfactorily explain the observed correlations between the 12 items of subscale L. Four factors have eigenvalues greater than unity. The scree plot suggests the extraction of a single factor or the extraction of three factors. The result obtained for the factor L subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the Trusting-Suspicious factor can be split into meaningful sub-factors. To examine this question the loadings of the items on each one of the four extracted factors were examined. From the rotated factor matrix shown in Table 4.10a, no clear, interpretable factor loading pattern emerges that would suggest a meaningful fission of the Trusting-Suspicious factor. For factor 1, there are four items (Q63, Q88, Q89 and Q113) with loadings greater than 0,30. Three items (Q14, Q38 and Q39) load on factor 2 with loadings greater 0,30. Factors three has four items (Q13, Q39, Q63 and Q163) with loadings greater than 0,30. Factor four has only one item (Q188) with a loading greater than 0,30. Two items (Q64 and Q138) did not load on any of the five extracted factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the five factors. It is therefore not possible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

TABLE 4.10a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR L)

	Factor			
	1	2	3	4
15FQ+_FL_Q13	,030	,155	**,426**	-,059
15FQ+_FL_Q14	,283	**,611**	,190	,049
15FQ+_FL_Q38	,131	**,517**	,034	,054
15FQ+_FL_Q39	,145	**,590**	,372	,014
15FQ+_FL_Q63	**,306**	-,065	,406	-,057
15FQ+_FL_ Q64	,225	,071	,249	,211
15FQ+_FL_Q88	**,497**	,116	,166	,185
15FQ+_FL_Q89	**,718**	,025	,096	,082
15FQ+_FL_Q113	**,695**	,160	,052	-,048
15FQ+_FL_Q138	-,126	,247	,055	,074
15FQ+_FL Q163	,048	,243	**,548**	-,003
15FQ+_FL_Q188	,075	,111	-,114	**,680**

a. Rotation converged in 7 iterations.

To examine how well the 12 factor L items represent a single underlying factor if a single underlying factor would be assumed, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.10b.

TABLE 4.10b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR L)

	Factor
	1
15FQ+_FL_Q13	,297
15FQ+_FL_Q14	**,620**
15FQ+_FL_Q38	,390
15FQ+_FL_Q39	**,582**
15FQ+_FL_Q63	,342
15FQ+_FL_Q64	,340
15FQ+_FL_Q88	**,501**
15FQ+_FL_Q89	**,505**
15FQ+_FL_Q113	**,536**
15FQ+_FL_Q138	,089
15FQ+_FL_Q163	,405
15FQ+_FL_Q188	,125

a. 1 factor extracted. 5 iterations required

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor L. Five of the 12 items had loadings higher than 0,50 (nine items loaded higher than 0,30 on the single factor). The single factor therefore explains less than 25% of the variance in seven of the twelve subscale items. To combine the 12 factor L items into two linear composites to represent this factor in the measurement model should therefore be regarded as somewhat questionable.

The residuals correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (10%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides quite a credible explanation for the observed inter-item correlation matrix. The four extracted factors explained 55,826% of the total sub-scale variance in the initial solution but only 35,293% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (60%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a credible explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 24,37% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Trusting-Suspicious factor subscale reflect one indivisible underlying theme.

4.3.6.10 Dimensionality analysis: Factor M

The investigation of the uni-dimensionality assumption that the 12 items comprising the Concrete-Abstract subscale all reflect a single underlying personality factor, indicates that four factors are required to satisfactorily explain the observed correlations between the 12 items of subscale M. Four factors have eigenvalues greater than unity. The scree plot suggests the extraction of a single factor or the extraction of three factors. The results obtained for the factor M subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the splitting of the Concrete-Abstract factor would result in meaningful factor fission. To examine this question the item loadings of the items on each one of the four extracted factors were examined. From the rotated factor matrix shown in Table 4.11a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Concrete-Abstract factor. For factor 1 there are five items (Q15, Q40, Q139, Q164 and Q165) with loadings greater than 0,30. Only one item (Q90) load on factor 2 with loadings greater than 0,30. Factor three has two items (Q65 and Q114) with loadings greater than 0,30. Factor four has three items (Q115, Q189 and Q190) with a loading greater than 0,30. One item (Q140) did not load on any of the four extracted factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the five factors. It is therefore difficult to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed to the use of an inappropriate rotation technique.

TABLE 4.11a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR M)

	Factor			
	1	2	3	4
15FQ+_FM_Q15	**,342**	,068	,017	,293
15FQ+_FM_Q40	**,352**	,109	-,013	,117
15FQ+_FM_Q65	,046	-,093	**,552**	,062
15FQ+_FM_Q90	,072	**,915**	-,009	-,011
15FQ+_FM_Q114	,.080	,059	**,577**	,038
15FQ+_FM_ Q115	-,057	-,056	,125	**,460**
15FQ+_FM_Q139	**,635**	-,019	,056	,129
15FQ+_FM_Q140	,223	,184	-,011	-,082
15FQ+_FM_Q164	**,411**	-,014	,127	,007
15FQ+_FM_Q165	**,309**	,043	,209	,043
15FQ+_FM Q189	,192	-,027	-,064	**,339**
15FQ+_FM_Q190	,130	,034	,289	**,337**

a. Rotation converged in 6 iterations.

To examine how well the 12 factor M items represent a single underlying factor if a single underlying factor would be assumed, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.11b.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all designed to reflect factor M. Only one item (Q139) of the 12 items had loadings higher than 0,50 (six items load higher than 0,30 on the single extracted factor). The single factor therefore explains less than 25% of the variance in eleven of the twelve items. To combine the 12 factor M items into two linear composites to represent this factor in the measurement model therefore is somewhat difficult to justify. Neither do the results depicted in Table 4.11a and Table 4.10b really justify combining the item scores on these 12 items into a measure of factor M.

TABLE 4.11b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR M)

	Factor 1
15FQ+_FM_Q15	,412
15FQ+_FM_Q40	,338
15FQ+_FM_Q65	,249
15FQ+_FM_Q90	,112
15FQ+_FM_Q114	,291
15FQ+_FM_Q115	,172
15FQ+_FM_Q139	**,544**
15FQ+_FM_Q140	,161
15FQ+_FM_Q164	,385
15FQ+_FM_Q165	,368
15FQ+_FM_Q189	,252
15FQ+_FM_Q190	,361

a. 1 factor extracted. 6 iterations required

The residuals correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (6%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a convincing explanation for the observed inter-item correlation matrix. The four extracted factors explained 48,528% of the total sub-scale variance in the initial solution but only 27,584% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (50%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does provide a questionable explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 17,64% of the total subscale variance. This outcome suggests that the one factor solution does not provide a credible explanation as to why the subscale items correlate the way they do in the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Concrete-Abstract factor subscale reflect one indivisible underlying theme.

4.3.6.11 Dimensionality analysis: Factor N

The investigation of the uni-dimensionality assumption that the 12 items comprising the Direct-Restrained subscale all reflect a single underlying personality factor indicates that four factors are required to satisfactorily explain the observed correlations between the 12 items of subscale N. Four factors have eigenvalues greater than unity. The scree plot suggests the extraction of two factors. The result obtained for the factor N subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the splitting of the Direct-Restrained factor would result in a meaningful set of sub-factors. To examine this question the loadings of the items on each one of the four extracted factors were examined. From the rotated factor matrix shown in Table 4.12a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Direct-Restrained factor. For factor 1, there are only two items (Q116 and Q166) with loadings greater than 0,30. Five items (Q16, Q17, Q91, Q92 and 191) load on factor 2 with loadings greater than 0,30. Factor three has four items (Q16, Q41, Q42 and Q67) with loadings greater than 0,30. Factor four has three items (Q66, Q141 and Q191) with a loading greater than 0,30. Two items (Q16 and Q191) showed themselves as complex items each simultaneously loading on two factors.

No meaningful underlying theme could be detected in the wording of the items loading on each of the four factors. It is therefore not possible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed to the use of an inappropriate rotation technique.

TABLE 4.12a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR N)

	Factor			
	1	2	3	4
15FQ+_FN_Q16	-,017	**,341**	**,300**	-,055
15FQ+_FN_Q17	,001	**,427**	,005	,156
15FQ+_FN_Q41	,079	,014	**,644**	-,002
15FQ+_FN_Q42	,179	,085	**,499**	,097
15FQ+_FN_Q66	,131	,176	,067	**,695**
15FQ+_FN_ Q67	,155	,158	,351	,223
15FQ+_FN_Q91	,243	**,512**	,144	,198
15FQ+_FN_Q92	,141	**,407**	,220	,164
15FQ+_FN_Q116	**,807**	,131	,190	,057
15FQ+_FN_Q141	-,086	,193	,082	**,358**
15FQ+_FN Q166	**,492**	,036	,096	-,003
15FQ+_FN_Q191	,051	**,465**	-,037	**,351**

a. Rotation converged in 7 iterations.

To examine how well the 12 factor N items represent an assumed single underlying factor , the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.12b.

TABLE 4.12b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR N)

	Factor
	1
15FQ+_FN_Q16	,310
15FQ+_FN_Q17	,326
15FQ+_FN_Q41	,313
15FQ+_FN_Q42	,400
15FQ+_FN_Q66	,461
15FQ+_FN_Q67	,445
15FQ+_FN_Q91	**,586**
15FQ+_FN_Q92	**,504**
15FQ+_FN_Q116	,466
15FQ+_FN_Q141	,281
15FQ+_FN_Q166	,275
15FQ+_FN_Q191	,431

a. 1 factor extracted. 5 iterations required

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor N. Two of the 12 items had loadings higher than 0,50 (ten items had loadings of 0,30 or higher on the single extracted factor). The single factor therefore explains less than 25% of the variance in ten of the twelve subscale items. To combine the 12 factor N items into two linear composites to represent this factor in the measurement model is therefore somewhat difficult to justify. By the same argument the results depicted in Table 4.11a and Table 4.11b do not really justify combining the item scores on these 12 items into a measure of factor N.

The residuals correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (10%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a convincing explanation for the observed inter-item correlation matrix. The four extracted factors explained 54,527 % of the total sub-scale variance in the initial solution but only 33,477% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (48%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution fails to provide a credible explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 23,548 % of the total subscale variance. This outcome suggests that the one factor solution does not provide a credible explanation for the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Direct-Restrained factor subscale reflect one indivisible underlying theme.

4.3.6.12 Dimensionality analysis: Factor O

The evaluation of the uni-dimensionality assumption that the 12 items comprising the Confident-Self-doubting factor subscale all reflect a single underlying personality factor indicates that five factors are required to satisfactorily explain the observed correlations between the 12 items of subscale O. Five factors have eigenvalues greater than unity. The scree plot on the other hand suggests the extraction of a single factor. The result obtained for the factor O subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the extraction of multiple factors would result in a meaningful fission of the Confident-Self-doubting factor. To examine this question the loadings of the items on each of the five extracted factors were studied. From the rotated factor matrix shown in Table 4.13a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Confident-Self-doubting factor.

TABLE 4.13a

ROTATED FACTOR MATRIX FOR THE 5-FACTOR SOLUTION (FACTOR O)

	Factor				
	1	2	3	4	5
15FQ+_FO_Q18	,156	**,811**	-,059	,055	-,069
15FQ+_FO_Q43	,158	,004	**,414**	,100	-,098
15FQ+_FO_Q68	**,633**	,060	,195	,082	,097
15FQ+_FO_Q93	,041	,052	,091	,278	-,053
15FQ+_FO_Q117	,274	-,048	,076	**,372**	,151
15FQ+_FO_Q118	-,092	,284	,289	-,028	,247
15FQ+_FO_Q142	,283	-,049	-,046	,136	**,658**
15FQ+_FI_Q143	,173	-,061	-,106	**,430**	,113
15FQ+_FO_Q167	**,763**	,039	,092	,129	,080
15FQ+_FO_Q168	-,046	,058	,260	**,413**	,074
15FQ+_FO_Q192	,247	-,059	**,511**	,105	,059
15FQ+_FO_Q193	**,318**	,094	,202	,152	,110

a. Rotation converged in 14 iterations.

For factor 1, there are three items (Q68, Q167, and Q193) with loadings greater than 0,30. Only one item (Q18) loads on factor 2 with loadings greater 0,30. Factor three has two items (Q43 and Q192) with loadings greater than 0,30. Factor four has three items (Q117, Q143 and Q168) with loadings greater than 0,30 and factor five has only one item (Q142) with a loading greater than 0,30. Two items (Q93 and Q118) did not load on any of the five extracted factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the four factors. It is therefore not possible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

To examine how well the 12 factor O items represent an assumed single underlying factor , the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.13b.

TABLE 4.13b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR O)

	Factor
	1
15FQ+_FO_Q18	,142
15FQ+_FO_Q43	,278
15FQ+_FO_Q68	**,638**
15FQ+_FO_Q93	,165
15FQ+_FO_Q117	,431
15FQ+_FO_Q118	,110
15FQ+_FO_Q142	,375
15FQ+_FO_Q143	,281
15FQ+_FO_Q167	**,682**
15FQ+_FO_Q168	,234
15FQ+_FO_Q192	,408
15FQ+_FN_Q193	,440

a. 1 factor extracted. 6 iterations required

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all designed to reflect factor O. Only two items (Q68 and Q167) have loadings higher than 0,50 (six items load 0,30 or higher on the single extracted factor). The single factor therefore explains less than 25% of the variance in each of the remaining eleven items. To combine the 12 factor O items into two linear composites to represent this factor in the measurement model is therefore not really justified.

The residuals correlations were computed for both the 5-factor and the 1-factor solution. For the 5-factor solution a small percentage (3%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a plausible explanation for the observed inter-item correlation matrix. The five extracted factors explained 59,678% of the total sub-scale variance in the initial solution but only 34,243% of the observed variance in the extracted solution. For the 1-factor solution a large percentage

(46%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution fails to provide a convincing explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 21,341% of the total subscale variance. This outcome suggests that the one factor solution does not provide a credible explanation for the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Confident-Self-doubting factor subscale reflect one indivisible underlying theme.

4.3.6.13 Dimensionality analysis: Factor Q1

In the case of factor Q1, in investigating the uni-dimensionality assumption that the 12 items comprising the Conventional-Radical subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need four factors to explain the observed correlations between the 12 items of subscale Q1. Four factors have eigenvalues greater than unity. The scree plot also the extraction of four factors or the extraction of a single factor if interpreted more stringently. The result obtained for the factor Q1 subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the extraction of multiple factors would result in a meaningful fission of the Conventional -Radical factor. Meaningful factor fission would occur if a sufficient number of items would load on each extracted factor and a meaningful identity could be attached to each factor. To examine this latter question the loadings of the items on each of the four extracted factors have to be examined. Table 4.14a depicts the rotated factor structure. No clear, interpretable factor loading pattern emerges that would suggest that the Conventional-Radical factor can be split into a set of narrower sub-factors. For factor 1, there are two items (Q69 and Q144) with loadings greater than 0,30. Three items (Q19, Q44 and Q94) load on factor 2 with loadings greater 0,30. Factor three has two items (Q20 and Q45) with loadings greater than 0,30. Factor four has three items (Q70, Q95 and Q194) with loadings greater than 0,30. Two items (Q119 and Q169) did not load on any of the four extracted factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the four factors. It therefore is difficult to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

TABLE 4.14a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR Q1)

	Factor			
	1	2	3	4
15FQ+_FQ1_Q19	,118	**,437**	,086	,117
15FQ+_FQ1_Q20	,182	,166	**,327**	,164
15FQ+_FQ1_Q44	,035	**,775**	,005	,016
15FQ+_F Q1__Q45	,066	-,071	**,895**	,186
15FQ+_F Q1__Q69	**,765**	,133	,057	,274
15FQ+_F Q1__ Q70	,095	,103	,048	**,596**
15FQ+_F Q1__Q94	,234	**,377**	-,045	,131
15FQ+_F Q1_Q95	,102	-,035	,037	**,302**
15FQ+_FQ1__Q119	-,032	,046	,161	,270
15FQ+_FQ1__Q144	**,629**	,095	,108	,103
15FQ+_F Q1_ Q169	,250	,197	,033	-,035
15FQ+_FQ1__Q194	,101	,228	,123	**,451**

a. Rotation converged in 6 iterations.

To examine how well the 12 factor Q1 items represent an assumed single underlying factor , the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.14b.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all used according to the scoring key to reflect factor Q1. Only two items (Q69 and Q144) have loadings higher than 0,50 (eight of the twelve items have loadings higher than 0,30). The single factor therefore explains less than 25% of the variance in each of the remaining eleven items. To combine the 12 factor Q1 items into two linear composites to represent this factor in the measurement model is therefore not really justified. Neither, however, do the results depicted in Table 4.14a and Table 4.14b really justify combining the item scores on these 12 items into a measure of factor Q1.

TABLE 4.14b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR Q1)

	Factor 1
15FQ+_F Q1_Q19	,378
15FQ+_F Q1_Q20	,396
15FQ+_F Q1_Q44	,345
15FQ+_F Q1_Q45	,290
15FQ+_F Q1_Q69	**,635**
15FQ+_F Q1_Q70	,412
15FQ+_F Q1_Q94	,392
15FQ+_F Q1_Q95	,221
15FQ+_F Q1_Q119	,202
15FQ+_F Q1_Q144	**,503**
15FQ+_F Q1_Q169	,253
15FQ+_F Q1_Q194	,452

a. 1 factor extracted. 5 iterations required

The residuals correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (4%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a plausible explanation for the observed inter-item correlation matrix. The four extracted factors explained 52,555% of the total sub-scale variance in the initial solution but only 34,44% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (48%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a convincing explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 21,941% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Conventional-Radical factor subscale reflect one indivisible underlying theme.

4.3.6.14 Dimensionality analysis: Factor Q2

In the case of factor Q2, in investigating the uni-dimensionality assumption that the12 items comprising the Group-oriented–Self-sufficient subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need four factors to explain the observed correlations between the 12 items of subscale Q2. Four factors have eigenvalues greater than unity. The scree plot suggests the extraction of either a single factor or somewhat less convincingly the extraction of four factors. The result obtained for the factor Q2 subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument, one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether this outcome points to a meaningful fission of the Group-oriented–Self-sufficient factor. To examine this question the loadings of the items on each one of the four extracted factors would have to be examined. From the rotated factor matrix shown in Table 4.15a, no clear, interpretable pattern of loadings emerges that would suggest a meaningful fission of the Group-oriented–Self-sufficient factor.

TABLE 4.15a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR Q2)

	Factor			
	1	2	3	4
15FQ+_F Q2_Q21	,027	-,012	,020	**,379**
15FQ+_F Q2_Q46	,291	,095	-,073	-,157
15FQ+_F Q2_Q71	,061	**,347**	,087	,154
15FQ+_F Q2_Q96	,237	,224	,131	,203
15FQ+_F Q2_Q120	,114	,257	-,011	-,068
15FQ+_F Q2_Q121	,037	**,566**	,195	,126
15FQ+_F Q2_Q145	,120	,036	**,656**	-,059
15FQ+_F Q2_Q146	-,069	**,322**	**,500**	,082
15FQ+_F Q2_Q170	**,661**	-,076	,182	**,310**
15FQ+_F Q2_Q171	-,036	,206	-,065	**,629**
15FQ+_F Q2_Q195	**,516**	**,333**	,080	,013
15FQ+_F Q2_Q196	,186	,282	,268	**,305**

a. Rotation converged in 11 iterations

For factor 1, there are two items (Q170 and Q195) with loadings greater than 0,30. Four items (Q71, Q121, Q146 and Q195) load on factor 2 with loadings greater than 0,30. Factor three has two items (Q145 and Q146) with loadings greater than 0,30. Factor four has four items (Q21, Q170, Q171 and Q196) with loadings greater than 0,30. Three items (Q46, Q96 and Q120) did not load on any of the four extracted factors. Three items (Q146, Q170 and Q195) showed themselves as complex items each simultaneously loading on two factors.

No meaningful underlying theme could be identified in the wording of the items loading on each of the four factors. It therefore is difficult to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

To examine how well the 12 factor Q2 items represent an assumed single underlying factor, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.15b.

TABLE 4.15b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR Q2)

	Factor 1
15FQ+_F Q2_Q21	,172
15FQ+_F Q2_Q46	,084
15FQ+_F Q2_Q71	,356
15FQ+_F Q2_Q96	,415
15FQ+_F Q2_Q120	,171
15FQ+_F Q2_Q121	,486
15FQ+_F Q2_Q145	,317
15FQ+_F Q2_Q146	,408
15FQ+_F Q2_Q170	,406
15FQ+_F Q2_Q171	,301
15FQ+_F Q2_Q195	,457
15FQ+_F Q2_Q196	**,548**

a. 1 factors extracted. 5 iterations required

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor Q2. Only one item (Q196) has a loading higher than 0,50 (nine items load 0,30 or higher on the single extracted factor). The single factor therefore explains less than 25% of the variance in eleven of the twelve items.

To combine the 12 factor Q2 items into two linear composites to represent this factor in the measurement model is therefore not really justified.

The residuals correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (6%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a quite convincing explanation for the observed inter-item correlation matrix. The four extracted factors explained 51,175% of the total sub-scale variance in the initial solution but only 29,494% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (43%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution fails to provide a credible explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 20,376% of the total subscale variance. This outcome suggests that the one factor solution does not provide a credible explanation for the pattern of inter-item correlations in the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the assumption underlying the scoring key that all items comprising the Group-oriented–Self-sufficient factor subscale reflect one indivisible underlying theme

4.3.6.15 Dimensionality analysis: Factor Q3

In the case of factor Q3, in investigating the uni-dimensionality assumption that the 12 items comprising the Informal-Self-disciplined subscale all reflect a single underlying personality factor, the SPSS exploratory factor analysis results suggest that one would need four factors to explain the observed correlations between the 12 items of subscale Q3. Four factors have eigenvalues greater than unity. The scree plot suggests the extraction of a single factor, or if interpreted somewhat more leniently, the extraction of four factors. The result obtained for the factor Q3 subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether the extraction of four factors would result in a meaningful fission of the Informal-Self-disciplined factor. To examine this question the loadings of the items on each one of the four extracted factors were examined. From the rotated factor matrix shown in Table 4.16a, no clear, interpretable pattern of loadings emerge that would suggest a meaningful fission of the Informal-Self-disciplined factor. For factor 1, there are seven items (Q22, Q48, Q73, Q97, Q122, Q147 and Q197) with loadings greater than 0,30. Only one item (Q172) loads on factor 2 with a loading greater 0,30. Factor three has two items (Q22 and Q23) with loadings greater than 0,30. Factor four has two items (Q72 and Q73) with loadings greater than 0,30. Two items (Q47 and Q98) did not load on any of the four extracted factors. Two items (Q22 and Q73) presented themselves as complex items, each simultaneously loading on two factors.

TABLE 4.16a

ROTATED FACTOR MATRIX FOR THE 4-FACTOR SOLUTION (FACTOR Q3)

	Factor			
	1	2	3	4
15FQ+_F Q3_Q22	**.557**	-,025	**,308**	-,103
15FQ+_FQ3_Q23	,169	,028	**,647**	,003
15FQ+_FQ3_Q47	,020	,093	,299	,209
15FQ+_FQ3_Q48	**,519**	,181	-,054	-,038
15FQ+_FQ3_Q72	,069	,067	,064	**,604**
15FQ+_FQ3_Q73	**,606**	**,**036	,201	**,307**
15FQ+_FQ3_Q97	**,346**	,036	,182	,119
15FQ+_FQ3_Q98	,221	,154	,079	,129
15FQ+_FQ3_Q122	**,322**	-,154	**,**070	,258
15FQ+_FQ3_Q147	**,463**	,094	,115	,011
15FQ+_FQ3_Q172	**,**197	**,921**	,120	,074
15FQ+_FQ3_Q197	**,491**	,098	-,039	,227

Rotation converged in 7 iterations.

No meaningful underlying theme could be isolated in the wording of the items loading on each of the four factors. It is therefore not possible to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale A, that the inability to meaningfully interpret the extracted factors could also not be attributed to the use of an inappropriate rotation technique.

To examine how well the 12 factor Q3 items represent an assumed single underlying factor, the researcher forced SPSS to extract a single factor. The resultant factor matrix when forcing the extraction of a single factor is shown below in Table 4.16b.

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all earmarked by the scoring key to reflect factor Q3. Only two items (Q22 and Q73) have loadings higher than 0,50 (ten of the twelve items load 0,30 or higher on the single extracted factor). The single factor therefore explains less than 25% of the variance in ten of the twelve items. To combine the 12 factor Q3 items into two linear composites to represent this factor in the measurement model is therefore somewhat problematic.

TABLE 4.16b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR Q3)

	Factor
	1
15FQ+_FQ3_Q22	**,524**
15FQ+_FQ3_Q23	,336
15FQ+_FQ3_Q47	,204
15FQ+_FQ3_Q48	,446
15FQ+_FQ3_Q72	,249
15FQ+_FQ3_Q73	**,698**
15FQ+_FQ3_Q97	,416
15FQ+_FQ3_Q98	,301
15FQ+_FQ3_Q122	,330
15FQ+_FQ3_Q147	,473
15FQ+_FQ3_Q172	,352
15FQ+_FQ3_Q197	,499

a. 1 factor extracted. 6 iterations required.

The residual correlations were computed for both the 4-factor and the 1-factor solution. For the 4-factor solution a small percentage (13%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution does not provide a reasonably credible explanation for the observed inter-item correlation matrix. The four extracted factors explained 52,936% of the total sub-scale variance in the initial solution but only 34,213% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (45%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a plausible explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 24,174% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Informal-Self-disciplined factor subscale reflect one indivisible underlying theme.

4.3.6.16 Dimensionality analysis: Factor Q4

The evaluation of the uni-dimensionality assumption that the 12 items comprising the Composed-Tense-driven factor subscale all reflect a single underlying personality factor indicates that five factors are required to satisfactorily explain the observed correlations between the 12 items of subscale Q4. Five factors have eigenvalues greater than unity. The scree plot also suggests the extraction of five factors. The result obtained for the factor Q4 subscale are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations, but rather the fact that all twelve items do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor.

The question arises whether this outcome points to a meaningful fission of the Composed-Tense-driven factor. To examine this question one would need to scrutinize the item loadings of the items on each one of the five extracted factors. From the rotated factor matrix shown in Table 4.17a, no clear, interpretable pattern of loadings emerges that would suggest a meaningful fission of the Composed-Tense-driven factor. For factor 1, there are four items (Q99, Q123, Q174 and Q198) with loadings greater than 0,30. Three items (Q24, Q49 and Q74) load on factor 2 with loadings greater 0,30. Factor three has three items (Q123, Q148 and Q173) with loadings greater than 0,30. Factor four has one item (Q124) with a loading greater than 0,30. Factor five has only one item (Q149) with a loading greater than 0,30. One item (Q199) did not load on any of the five extracted factors. One item (Q123) showed itself as a complex item simultaneously loading on two factors.

No meaningful underlying theme could be found in the wording of the items loading on each of the four factors. It is therefore difficult to assign a meaningful label to each of the extracted factors that would reflect their identity. It was assumed, given the findings reported for subscale Q4, that the inability to meaningfully interpret the extracted factors could also not be attributed the use of an inappropriate rotation technique.

TABLE 4.17a

ROTATED FACTOR MATRIX FOR THE 5-FACTOR SOLUTION (FACTOR Q4)

	Factor				
	1	2	3	4	5
15FQ+_FQ4_Q24	,011	**,355**	,128	,110	,250
15FQ+_FQ4_Q49	,086	**,508**	,031	,071	,094
15FQ+_FQ4_Q74	,278	**,529**	,205	,100	-,028
15FQ+_FQ4_Q99	**,563**	,188	,045	-,052	,249
15FQ+_FQ4_Q123	**,309**	,011	**,301**	,041	-,208
15FQ+_FQ4_Q124	,073	,042	,028	**,685**	,040
15FQ+_FQ4_Q148	,160	,108	**,362**	,178	,125
15FQ+_FQ4_Q149	,128	,106	,069	,073	**,580**
15FQ+_FQ4_Q173	,220	,139	**,590**	-,115	,064
15FQ+_FQ4_Q174	**,475**	,024	,171	,046	,033
15FQ+_FQ4_Q198	**,390**	,247	,123	,159	,018
15FQ+_FQ4_Q199	-,030	,191	,288	,208	,237

a. Rotation converged in 10 iterations.

To examine how well the 12 factor Q4 items represent an assumed single underlying factor, the researcher forced SPSS to extract a single factor. The resultant factor matrix is shown below in Table 4.17b.

TABLE 4.17b

FACTOR MATRIX WHEN FORCING THE EXTRACTION OF A SINGLE FACTOR (FACTOR Q4)

	Factor
	1
15FQ+_FQ4_Q24	,299
15FQ+_FQ4_Q49	,363
15FQ+_FQ4_Q74	**,549**
15FQ+_FQ4_Q99	,489
15FQ+_FQ4_Q123	,276
15FQ+_FQ4_Q124	,186
15FQ+_FQ4_Q148	,405
15FQ+_FQ4_Q149	,307
15FQ+_FQ4_Q173	,452
15FQ+_FQ4_Q174	,390
15FQ+_FQ4_Q198	,472
15FQ+_FQ4_Q199	,325

a. 1 factors extracted. 6 iterations required

The loadings of the 12 items on the single extracted factor are generally low despite the fact that they are all designed according to the scoring key to reflect factor Q4. Only one item (Q74) has a loading higher than 0,50 (nine items load 0,30 or higher on the single extracted factor). The single factor therefore explains less than 25% of the variance in eleven of the twelve items. To combine the 12 factor Q4 items into two linear composites to represent this factor in the measurement model is therefore not really justified.

The residual correlations were computed for both the 5-factor and the 1-factor solution. For the 5-factor solution a small percentage (4%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the rotated factor solution provides a convincing explanation for the observed inter-item correlation matrix. The five extracted factors explained 59,117% of the total sub-scale variance in the initial solution but only 31,588% of the observed variance in the extracted solution. For the 1-factor solution a large percentage (46%) of non-redundant residuals had absolute values greater than 0,05 thus suggesting that the forced factor solution does not provide a credible explanation for the observed inter-item correlation matrix. The one extracted factor accounted for 21,917% of the total subscale variance. This outcome suggests that the one factor solution is not credible as an explanation of the observed correlation matrix.

The foregoing basket of evidence forces one to conclude that there is little support for the design assumption that all items comprising the Composed-Tense-driven factor subscale reflect one indivisible underlying theme.

4.3.7 SUMMARY OF THE DIMENSIONALITY ANALYSIS RESULTS

The scoring key of the 15FQ+ reflects the intention to construct essentially one-dimensional sets of 12 items that would reflect variance in each of the 16 latent variables collectively constituting the personality domain. These items are meant to operate as stimulus sets to which test takers respond with behaviour that is primarily an expression of a specific underlying latent personality variable. These items, however, also reflect to varying degrees other latent personality dimensions comprising the personality domain. The latent first-order personality dimension any given set of 12 items is primarily meant to reflect is assumed to be a uni-dimensional construct.

The results of the dimensionality analyses do not correspond to the results one would have expected if the design intention of the 15FQ+ would have succeeded. The results of the dimensionality analyses suggest that for each of the sixteen subscales the behavioural response of Black South African managers to the set of subscale items is not primarily an expression of the specific first-order personality dimension the set of items is meant to reflect. Rather the items included in each subset seem to reflect a collection of latent variables. Little success was achieved in establishing the identity of these latent variables. No convincing common theme related to the personality dimension of interest could be isolated.

That leaves the question unanswered as to what the extracted factors represent. The possibility that they may represent artefact factors reflecting differences in item statistics has to some degree been examined. No evidence of differential skewness was detected on any of the subscales. Differences in other items statistics could, however, exist that could possibly account for the extracted factors. Another possibility that has not been explored in this study is that the factors may represent systematic differences in the manner in which the items are worded (e.g., whether the item contains idiomatic expressions or whether the item was originally positively or negatively worded). A further possibility that has not been explored is that the factors may represent salient characteristics of situations (Mischel, 2004) that moderate the manner in which the personality dimension expresses itself in behaviour.

4.4 ITEM ANALYSIS

The structural design of the 15FQ+ reflects an intention to construct essentially one-dimensional sets of items that would reflect variance in each of the 16 latent variables collectively constituting the personality domain as interpreted by the 15FQ+. These items are meant to operate as stimulus sets to which test takers respond with behaviour that is primarily an expression of a specific underlying personality latent variable. These items, however, also reflect to varying degrees other latent personality dimensions comprising the personality domain. To the extent that the personality dimensions being measured are broad constructs requiring a diversity of behavioural indicators, and to the extent that these behavioural indicators are expressions of the whole personality, these items are not expected to correlate extremely high. Nonetheless, to the extent that they are designed to reflect the standing on a uni-dimensional personality dimension, moderate inter-item correlations are expected for the items allocated to a subscale. To determine how well the items represent the content of any particular underlying factor, various descriptive item statistics are calculated. The purpose with the calculation of these item statistics is to detect poor items[16]. Poor items are items that fail to discriminate between different states of the latent variable they are meant to reflect and items that do not, in conjunction with their subscale colleagues, reflect a common latent variable.

Classical measurement theory item statistics would include amongst others the item-total correlation, the squared multiple correlation, the change in subscale reliability when the item is deleted, the change in subscale variance if the item is deleted, the inter-item correlations, the item mean and the item standard deviation (Murphy & Davidshofer, 2005).

The item-total correlation is described by Taylor (2005) as the correlation of the item with the sum on all the items in a particular scale excluding the item itself. Taylor (2005) interprets a low item-total correlation as implying that the item is not related to the construct being measured. The converse is, however, not necessarily true. A high item-total correlation would mean that the items in a subscale generally measure the same "something". This underlying "something" is, however, not necessarily uni-dimensional nor necessarily the intended construct. A high negative correlation would indicate the need to reflect the item.

The squared multiple correlation is a closely aligned item statistic that in a similar fashion sheds light on the psychometric calibre of an item. It is the squared multiple correlation when regressing the item on a weighted linear composite of the remainder of the items of the subscale. A low squared multiple correlation would suggest that the item does not, in conjunction with its subscale peers, reflect a common underlying latent variable (Murphy & Davidshofer, 2005). A high squared multiple correlation would indicate that a weighted composite of subscale items explains a substantial amount of variance in the item, suggesting that they reflect a common underlying latent variable (although not necessarily the intended, to be measured construct or a uni-dimensional construct).

Taylor (2005) adds that another method of determining whether an item has the same meaning as the rest of the scale is to determine the reliability coefficient of the subscale if that item is removed. Where the reliability of the scale improves with the removal of an item, this

[16] Normally the objective would be to detect poor items with the objective of either rewriting them in an attempt to salvage them or, if this is not possible, to delete them from the subscale. Again, as argued before, these are in the case of this study not viable options.

would indicate that the item lowers the scale's reliability and is not a good indicator of the construct measured by the scale.

The change in subscale variance if the item is deleted would be a further item statistic that would reflect the success with which the item serves its intended purpose. An increase in the subscale variance if the item is deleted or a small drop in the subscale variance would indicate a problematic item. In the former instance the reflection of the item would be indicated. The variance of a p-component linear composite (X_t) can be expressed as equation 2:

$$S^2_t = S^2_1 + S^2_2 + \ldots + S^2_p + 2S_1S_2r_{12} + 2S_1S_3r_{13} + \ldots + 2S_{(p-1)}S_pr_{p(p-1)} \qquad [2]$$

It follows from equation 2 that if S^2_i is low and/or item i correlates low with the rest of the items of the subscale that the variance of the linear composite would drop relatively little it item i would be deleted. Items that do not, in conjunction with their subscale peers, reflect a common latent variable would correlate low with the remainder of the items in a subscale.

Items with small item variances would indicate items that fail to sensitively reflect differences in the latent variable (assuming a diverse item analysis sample). Items with small item variances would moreover not co-vary strongly with its subscale peers. An item with an extreme high (or low) mean would imply a positively (or negatively) skewed item score distribution (because it would imply that the distribution would be curtailed at the lower (or upper) end of the distribution) which in turn would exert downward pressure on the item variance.

Decisions on the psychometric credentials of any item should not be based on any single item statistic. Rather a basket of item statistic evidence needs to be assembled to arrive at a verdict on the psychometric merits of any specific item (Theron, 2002b).

4.4.1 DISCUSSION OF THE ITEM ANALYSIS RESULTS OF THE INDIVIDUAL 15FQ+ SCALES.

The classical measurement theory item statistics discussed above were calculated for each of the 15FQ+ subscales. Examination of these item statistics would typically result in the deletion of one or more items. As for the instrument under study, this would not be possible as argued above with regards to the manner in which the study should respond to the dimensionality analysis results. Decisions as to whether the items of the 15FQ+ should be culled, modified or replaced should come from the developers of the instrument on the basis of research feedback. A summary of the item analysis results for each of the 15 FQ^+ subscales is presented in Table 4.18.

Table 4.18 portrays a somewhat sombre psychometric picture in as far as it indicates that most subscales retained values for the coefficient of internal consistency lower than those reported in Table 2.7 for a sample of (predominantly) White South African managers and those reported in Table 2.8 for a sample of (predominantly) White South African professional and management development candidates. Only two subscales (Factor G and Factor H) meet the benchmark reliability standard of 0,70. The reliability coefficients for two subscales (factor I and Factor C) approach the 0,70 standard. In fairness, however, it needs to be acknowledged that personality measures generally do tend to display somewhat lower coefficients of internal consistency (Smit, 1996).

TABLE 4.18

A SUMMARY OF RESULTS OF THE ITEM ANALYSES OF THE 15FQ+ SUBSCALES

Subscale	Sample size	Mean	Variance	Standard deviation	Cronbach alpha
fA	241	19,27	8,831	2,895	,455
fB	241	19,30	11,685	3,187	,586
fC	241	17,46	17,558	4,190	,689
fE	241	16,71	14,457	3,802	,601
fF	241	13,81	24,694	4,969	,683
fG	241	19,20	17,283	4,157	,725
fH	241	15,51	30,368	5,511	,765
fI	241	14,25	22,738	4,768	,658
fL	241	8,98	21,879	4,677	,699
fM	241	10,36	15,655	3,957	,558
fN	241	19,92	12,885	3,590	,661
fN	241	11,85	23,908	4,890	,631
fQ_1	241	10,01	24,208	4,920	,658
fQ_2	241	6,96	16,482	4,060	,607
fQ_3	241	19,62	11,944	3,456	,654
fQ_4	241	7,89	22,163	4,708	,654

4.4.1.1 Item analysis: factor A

Table 4.19a provides more detailed results of the item analysis for the Aloof-Empathic sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.19a

RELIABILITY ANALYSIS OF THE FACTOR A SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	CronbachAlpha if Item Deleted
15FQ+_FA_Q1	17,33	7,831	,239	,228	,429
15FQ+_FA_Q2	18,51	7,893	-,080	,091	**,547**
15FQ+_FA_Q26	18,07	7,579	,094	,038	**,457**
15FQ+_FA_Q27	17,36	7,757	,267	,191	,424
15FQ+_FA_Q51	17,51	7,543	,126	,077	,446
15FQ+_FA_Q52	17,66	6,650	,301	,167	,385
15FQ+_FA_Q76	17,62	7,320	,274	,124	,407
15FQ+_FA_Q77	17,37	7,274	,436	,365	,386
15FQ+_FA_Q101	17,87	6,832	,168	,129	,438
15FQ+_FA_Q126	17,31	8,230	,054	,064	**, 564**
15FQ+_FA_Q151	17,43	7,505	,248	,130	,417
15FQ+_FA_Q176	17,94	6,284	,284	,146	,387

Table 4.19b displays the inter-item correlations for the factor A subscale.

TABLE 4.19b

INTER-ITEM CORRELATION MATRIX: FACTOR A

	15FQ+_fA_Q1	15FQ+_fA_Q2	15FQ+_fA_Q26	15FQ+_fA_Q27	15FQ+_fA_Q51	15FQ+_fA_Q52	15FQ+_fA_Q76	15FQ+_fA_Q77	15FQ+_fA_Q101	15FQ+_fA_Q126	15FQ+_fA_Q151	15FQ+_fA_Q176
15FQ+_fA_Q1	1,00	-,114	-,074	,208	,008	,154	.114	,395	,072	,165	,227	,224
15FQ+_fA_Q2	-,114	1,00	,031	,047	,007	-,038	.106	-,082	-,181	-,118	-,022	-,023
15FQ+_fA_Q26	-,074	,031	1,000	,081	,076	,017	.106	,057	,072	-,027	-,001	,032
15FQ+_fA_Q27	,208	,047	,081	1,000	,129	,267	.008	,361	,026	,008	,062	,099
15FQ+_fA_Q51	,008	,007	,076	,129	1,000	,117	.085	,204	-,005	,096	,036	-,013
15FQ+_fA_Q52	,154	-,038	,017	,267	,117	1,000	.118	,304	,188	-,032	,114	,210
5FQ+_fA_Q76	,114	,106	,106	,008	,085	,118	1.000	,236	,178	,026	,106	,087
15FQ+_fA_Q77	,395	-,082	,057	,361	,204	,304	.236	1,000	,121	,045	,288	,248
15FQ+_fA_Q101	,072	-,181	,072	,026	-,005	.188	,178	,121	1,000	,047	,106	,209
15FQ+_fA_Q126	,165	-,118	-,027	,008	,096	-.032	,026	,045	,047	1,000	,117	,070
15FQ+_fA_Q151	,227	-,022	-,001	,062	., 36	.114	,106	,288	,106	,117	1,000	,222
15FQ+_fA_Q176	,224	-,023	,032	,099	-,013	.210	,087	,248	,209	,070	,222	1,000

Table 4.19a and Table 4.19b show a somewhat incoherent set of items which, although they were all meant to measure factor A, nonetheless do not seem to respond in unison to systematic differences in a single underlying latent variable. This can be seen in the low (and at times negative) item-total correlations, the low squared multiple correlations (Table 4.19a) and the low (and at times negative) inter-item correlations in Table 4.19b. Substantial increases in the subscale Cronbach alpha if three of the subscale items (Q2, Q26 and Q126) were to be deleted, along with the small item-total correlation and squared multiple correlation values associated with these items, point to the need to delete these items.

Under normal circumstances, if using this measure's items to test a structural model one has developed, one would delete such items to create psychometrically satisfactory measures to test the model. The dimensionality analysis results reported in Table 4.2a moreover suggest that if the deletion of poor items was an option, this procedure would have resulted in the sequential deletion of all the items except the four items that load on the first factor. The results shown in Tables 4.19a and 4.19b explain the unsatisfactory Cronbach alpha (,455) of this factor reported in Table 4.18. The item statistics associated with the flagged items indicate that these are poor items that do not reflect the same underlying factor as the rest in that item parcel.

4.4.1.2 Item analysis: factor B

Table 4.20a provides more detailed results of the item analysis for the Intellectance sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.20a

RELIABILITY ANALYSIS OF THE FACTOR B SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach Alpha if Item Deleted
15FQ+_FB_Q3	17,71	9,924	,305	,199	,552
15FQ+_FB_Q28	17,51	10,526	,289	,196	,560
15FQ+_FB_Q53	18,48	9,767	,177	,217	**,591**
15FQ+_FB_Q78	17,70	9,820	,332	,209	,546
15FQ+_FB_Q102	17,71	9,734	,279	,097	,557
15FQ+_FB_Q103	17,59	10,944	,067	,084	**,602**
15FQ+_FB_Q127	17,43	10,746	,256	,130	,567

15FQ+_FB_Q128	17,41	10,985	,202	,227	,575
15FQ+_FB_Q152	17,41	11,019	,167	,078	,579
15FQ+_FB_Q153	17,77	9,102	,424	,241	,520
15FQ+_FB_Q177	18,10	9,457	,232	,221	,574
15FQ+_FB_Q178	17,48	10,234	,338	,169	,550

Table 4.20b displays the inter-item correlations for the factor B subscale.

TABLE 4.20b

INTER-ITEM CORRELATION MATRIX: FACTOR B

	15FQ+_fB_Q3	15FQ+_fB_Q28	15FQ+_fB_Q53	15FQ+_fB_Q78	15FQ+_fB_Q102	15FQ+_fB_Q103	15FQ+_fB_Q127	15FQ+_fB_Q128	15FQ+_fB_Q152	15FQ+_fB_Q1153	15FQ+_fB_Q177	15FQ+_fB_Q178
15FQ+_fB_Q3	1,00	,219	,055	,205	,125	,080	,059	,329	-,021	,223	,063	,244
15FQ+_fB_Q28	,219	1,000	,019	,265	,062	,187	,030	,237	,102	,300	-,055	,159
15FQ+_FB_Q53	,055	,019	1,000	,006	,100	-,142	,015	-,155	,072	,107	,407	,143
15FQ+_FB_Q78	,205	,265	,006	1,000	,167	,152	,176	,289	,126	,267	-,032	,205
15FQ+_fB_Q102	,125	,062	,100	,167	1,000	,088	,199	,062	,132	,171	,129	,125
15FQ+_fB_Q103	,080	,187	-,142	,152	,088	1,000	,016	,170	-,029	,043	-,081	,031
5FQ+_fB_Q127	,059	,030	,015	,176	,199	,016	1,000	,103	,205	,223	,142	,096
15FQ+_fB_Q128	,329	,237	-,155	,289	,062	,170	,103	1,000	-,006	,144	-,038	,000
15FQ+_fB_Q152	-,021	,102	,072	,126	,132	-029	,205	-,006	1,000	,121	,067	,072
15FQ+_fB_Q153	,223	,300	,107	,267	,171	,043	,223	,144	,121	1,000	,176	,307
15FQ+_fB_Q177	,063	-,055	,409	-,032	,129	-,081	,142	-,038	,067	,176	1,000	,145
15FQ+_fB_Q178	,244	,159	,143	,205	,125	,031	,096	,000	,072	,307	,145	1,000

Table 4.20a and Table 4.20b above show a somewhat incoherent set of items which do not seem to respond in unison to systematic differences in a single underlying latent variable despite the fact that they were all designed to reflect a common factor (factor B). This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.20a) and the low (and at times negative) inter-item correlations in Table 4.20b. Substantial increases in the subscale Cronbach alpha if two of the subscale items (Q53, Q103) were deleted, along with the small item-total correlation and squared multiple correlation values associated with these items, point to the need to delete these items. Under normal circumstances, if using this measure's items to test a structural model one has developed, one would delete such items to create psychometrically satisfactory measures to test the model. The dimensionality analysis results reported in Table 4.3a moreover suggest that if the deletion of poor items was an option, this procedure would have resulted in the sequential deletion of all but the five items that load on the first factor. The results shown in Tables

4.20a and 4.20b explain the unsatisfactory Cronbach alpha (,586) of this factor as reported in Table 4.18. The item statistics associated with the flagged items indicate that these are poor items that do not reflect the same underlying factor as the rest in that item parcel and in the subscale.

4.4.1.3 Item analysis: factor C

Table 4.21a provides more detailed results of the item analysis for the affected by feelings-emotional stability sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.21a

RELIABILITY ANALYSIS OF THE FACTOR C SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FC_Q4	15,85	15,128	,302	,148	,674
15FQ+_FC_Q5	15,60	16,350	,264	,147	,680
15FQ+_FC_Q29	16,49	15,109	,326	,192	,670
15FQ+_FC_Q30	15,95	15,806	,177	,083	**,694**
15FQ+_FC_Q54	15,66	16,452	,261	,122	,680
15FQ+_FC_Q55	16,37	14,534	,436	,238	,653
15FQ+_FC_Q79	16,30	14,004	,362	,168	666
15FQ+_FC_Q80	15,89	14,563	,395	,189	,659
15FQ+_FC_Q104	15,98	15,458	,395	,224	,663
15FQ+_FC_Q129	16,03	15,582	,318	,168	,672
15FQ+_FC_Q154	16,11	14,500	,324	,158	,672
15FQ+_FC_Q179	15,88	14,559	,401	,200	,658

Table 4.21b displays the inter-item correlations for the factor C subscale.

Table 4.21a and Table 4.21b above show a somewhat incoherent set of items which do not seem to respond in unison to systematic differences in a single underlying latent variable despite the fact that they were all designed to reflect a common factor (factor C). This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.20a) and the low (and at times negative, albeit less frequent than in the previous two subscales) inter-item correlations in Table 4.20b. In essence, this indicates that, although the subscale C item set is more homogenous than the previous two subscales, there is still a worrying lack of coherence in the subscale C items.

TABLE 4.21b

INTER-ITEM CORRELATION MATRIX: FACTOR C

	15FQ+_fC_Q4	15FQ+_fC_Q5	15FQ+_fC_Q29	15FQ+_fC_Q30	15FQ+_fC_Q54	15FQ+_fC_Q55	15FQ+_fC_Q79	15FQ+_fC_Q80	15FQ+_fC_Q104	15FQ+_fC_Q1129	15FQ+_fC_Q154	15FQ+_fC_Q179
15FQ+_fC_Q4	1,000	,158	,191	,039	,139	,237	,122	,185	,204	,120	,040	,253
15FQ+_fC_Q5	,158	1,000	-,022	,208	,163	,182	,094	,243	,148	,040	,161	,067
15FQ+_FC_Q29	,191	-,022	1,000	,085	-,028	,274	,184	,159	,302	,200	,142	,175
15FQ+_FC_Q30	,039	,208	,085	1,000	,068	,057	,102	,179	,085	-,029	,082	,120
15FQ+_fC_Q54	,139	,163	-,028	,068	1,000	,211	,153	,211	,154	,059	,119	,173
15FQ+_fC_Q55	,237	,182	,274	,057	,211	1,000	,233	,198	,343	,241	,185	,197
5FQ+_fC_Q79	,122	,094	,184	,102	,153	,233	1,000	,189	,160	,179	,158	,331
15FQ+_fC_Q80	,185	,243	,159	,179	,211	,198	,189	1,000	,135	,155	,270	,188
15FQ+_fC_Q104	,204	,148	,302	,085	,154	,343	,160	,135	1,000	,289	,146	,174
15FQ+_fC_Q129	,120	,040	,200	-029	,059	,241	,179	,155	,289	1,000	,251	,159
15FQ+_fC_Q154	,040	,161	,142	,082	,119	,185	,158	,270	,146	,251	1,000	,206
15FQ+_fC_Q179	,253	,067	,175	,120	,173	,197	,331	,188	,174	,159	,206	1,000

A substantial increase in the subscale Cronbach alpha if one of the subscale items (Q30) were to be deleted, along with the small item-total correlation and squared multiple correlation values associated with this item, point to the need to delete this item. Under normal circumstances, if using this measure's items to test a structural model one has developed, one would delete such an item to create psychometrically satisfactory measures to test the model. The dimensionality analysis results reported in Table 4.4a would moreover suggest that if the deletion of Q30 were an option, this procedure would have resulted in the sequential deletion of all but the four items that load on the first factor. The results shown in Tables 4.20a and 4.20b explain the borderline satisfactory Cronbach alpha (,689) of this factor reported in Table 4.18.

4.4.1.4 Item analysis: factor E

Table 4.22a provides more detailed results of the item analysis for the Accommodating-Dominant sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

Table 4.21b displays the inter-item correlations for the factor E subscale.

TABLE 4.22a

RELIABILITY ANALYSIS OF THE FACTOR E SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FE_Q6	14,98	12,424	,342	,158	,564
15FQ+_FE_Q31	15,02	12,895	,235	*,100*	*,584*
15FQ+_FE_Q56	14,90	13,190	,276	,128	,580
15FQ+_FE_Q81	15,36	11,864	,290	*,106*	,573
15FQ+_FE_Q105	16,38	13,154	,167	,101	,597
15FQ+_FE_Q106	15,68	12,500	,160	,66	**,608**
15FQ+_FE_Q130	15,26	11,836	,338	,151	,561
15FQ+_FE_Q131	15,11	12,108	,324	,246	,565
15FQ+_FE_Q155	15,30	11,820	,340	,188	,561
15FQ+_FE_Q156	14,86	13,127	,280	,168	,579
15FQ+_FE_Q180	16,13	12,513	,197	,065	,595
15FQ+_FE_Q181	14,82	13,625	,201	,080	,592

Table 4.22a and Table 4.22b show a somewhat disjointed set of items which do not seem to respond in unison to systematic differences in a single underlying latent variable despite the fact they were all designed to measure factor E. This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.22a) and the low (and at times negative) inter-item correlations in Table 4.22b.

TABLE 4.22b

INTER-ITEM CORRELATION MATRIX: FACTOR E

	15FQ+_fE_Q6	15FQ+_fE_Q31	15FQ+_fE_Q56	15FQ+_fE_Q81	15FQ+_fE_Q105	15FQ+_fE_Q106	15FQ+_fE_Q130	15FQ+_fE_Q131	15FQ+_fE_Q155	15FQ+_fE_Q156	15FQ+_fE_Q180	15FQ+_fE_Q181
15FQ+_fE_Q6	1,000	,077	,135	,159	,082	,071	,195	,173	,326	,183	,140	,088
15FQ+_fE_Q31	,077	1,000	,096	,059	,124	,086	,224	,063	,109	,018	,142	,158
15FQ+_FE_Q56	,135	,096	1,000	,186	-,059	,159	,125	,240	,126	,094	,074	,153
15FQ+_FE_Q81	,159	,059	,186	1,000	,143	,088	,178	,163	,159	,134	,063	,109
15FQ+_fE_Q105	,082	,124	-,059	,143	1,000	,129	,129	-,041	-,008	,095	,148	,007
15FQ+_fE_Q106	,071	,086	,159	,088	,129	1,000	,055	-,015	,098	,033	,038	,108
5FQ+_fE_Q130	,195	,224	,125	,178	,129	,055	1,000	,230	,175	,102	,153	,031
15FQ+_fE_Q131	,173	,063	,240	,163	-,041	-,015	,230	1,000	,268	,352	,083	,180
15FQ+_fE_Q155	,326	,109	,126	,159	-,008	,098	,175	,268	1,000	,240	,076	,099
15FQ+_fE_Q156	,183	,018	,094	,134	,094	,033	,102	,352	,240	1,000	,032	,074
15FQ+_fE_Q180	,140	,142	,074	,063	,148	,038	,153	,083	,076	,032	1,000	,012
15FQ+_fE_Q181	,088	,158	,153	,109	,007	,108	,031	,180	,099	,074	,012	1,000

If all the items had successfully reflected a common underlying factor the items would have correlated higher with the subscale total score, the weighted linear composite of remaining items would have explained a more sizable proportion of the variance in each item and the subscale items would have consistently correlated higher and more positive with each other. A substantial increase in the subscale Cronbach alpha if one of the subscale items (Q106) were to be deleted, along with the small item-total correlation and squared multiple correlation values associated with this item, point to the need to delete this item. Under normal circumstances one would delete such an item to create a psychometrically satisfactory subscale measure. At first glance the need to delete only a single item seems to suggest a satisfactory state of affairs. Such a conclusion would, however, be misleading. The dimensionality analysis results reported in Table 4.5a would suggest that if the deletion of poor items, based on the Cronbach alpha, were an option, this procedure would have resulted in the sequential deletion of all but the four items that load on the first factor. The results shown in Tables 4.22a and 4.22b explain the unsatisfactory Cronbach alpha (,601) of this factor reported in Table 4.18.

4.4.1.5 Item analysis: factor F

Table 4.23a provides more detailed results of the item analysis for the Sober-serious-Enthusiastic sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.23a
RELIABILITY ANALYSIS OF THE FACTOR F SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FF_Q7	12,27	21,354	,365	,180	,657
15FQ+_FF_Q8	13,17	19,817	,506	,320	,632
15FQ+_FF_Q32	12,82	20,989	,323	,181	,663
15FQ+_FF_Q33	12,55	22,840	,117	,056	**,695**
15FQ+_FF_Q57	12,27	22,325	,221	,157	,677
15FQ+_FF_Q58	13,39	21,473	,368	,159	,657
15FQ+_FF_Q82	12,78	20,995	,314	,286	,664
15FQ+_FF_Q83	12,40	22,200	,203	,096	,681
15FQ+_FF_Q107	12,49	21,651	,287	,149	,668
15FQ+_FF_Q132	12,54	20,566	,395	,235	,651
15FQ+_FF_Q157	12,29	22,347	,241	,166	,674
15FQ+_FF_Q182	12,96	19,628	,498	,435	,632

Table 4.23b displays the inter-item correlations for the factor F subscale.

TABLE 4.23b

INTER-ITEM CORRELATION MATRIX: FACTOR F

	15FQ+_fF_Q7	15FQ+_fF_Q8	15FQ+_fF_Q32	15FQ+_fF_Q33	15FQ+_fF_Q57	15FQ+_fF_Q58	15FQ+_fF_Q82	15FQ+_fF_Q83	15FQ+_fF_Q107	15FQ+_fF_Q132	15FQ+_fF_Q157	15FQ+_fF_Q182
15FQ+_fF_Q7	1,000	,237	,099	,077	,139	,194	,060	,233	,198	,294	,206	,191
15FQ+_fF_Q8	,237	1,000	,167	,134	,274	,324	,232	,111	,179	,239	,278	,421
15FQ+_fF_Q32	,099	,167	1,000	,055	,070	,159	,328	,073	,115	,199	,017	,361
15FQ+_fF_Q33	,077	,134	,055	1,000	,011	,063	,043	,159	,031	-,021	,076	,016
15FQ+_fF_Q57	,139	,274	,070	,011	1,000	,142	,006	,049	,044	,052	,090	,310
15FQ+_fF_Q58	,194	,324	,159	,063	,142	1,000	,146	,070	,180	,220	,202	,229
5FQ+_fF_Q82	,060	,232	,328	,043	,006	,146	1,000	,039	,119	,147	-,015	,476
15FQ+_fF_Q83	,233	,111	,073	,159	,049	,070	,039	1,000	,045	,158	,011	,137
15FQ+_fF_Q107	,198	,179	,115	,031	,044	,180	,119	,045	1,000	,321	,216	,089
15FQ+_fF_Q132	,294	,239	,199	-,021	,052	,220	,147	,158	,321	1,000	,232	,235
15FQ+_fF_Q157	,206	,278	,017	,076	,090	,202	-,015	,011	,216	,232	1,000	,017
15FQ+_fF_Q182	,191	,421	,361	,016	,310	,229	,476	,137	,089	,235	,017	1,000

Table 4.23a and Table 4.23b show a somewhat disjointed set of items which do not respond in unison to systematic differences in a single underlying latent variable although they were all originally written to reflect factor F. Their inability to reflect a common underlying variable can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.23a) and the low (and in two cases negative) inter-item correlations in Table 4.23b. A substantial increase in the subscale Cronbach alpha would occur (initially) only if one of the subscale items (Q33) were deleted. This, along with the small item-total correlation and squared multiple correlation values associated with this item, points to the need to delete this item. Under normal circumstances Q33 would have been deleted to create a psychometrically more satisfactory measure. The dimensionality analysis results reported in Table 4.6a would suggest that if the deletion of poor items were an option, the deletion of Q33 would have resulted in additional items appearing as problematic in terms of the same item statistic. The procedure would eventually have resulted in the sequential deletion of all but the three items that load on the first factor. The results shown in Tables 4.23a and 4.23b explain the unsatisfactory Cronbach alpha (,683) of this factor reported in Table 4.18.

4.4.1.6 Item analysis: factor G

Table 4.24a provides more detailed results of the item analysis for the Expedient-Conscientious sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.24a

RELIABILITY ANALYSIS OF THE FACTOR G SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FG_Q9	17,39	14,906	,472	,294	,696
15FQ+_FG_Q34	17.68	13,885	,444	,293	,695
15FQ+_FG_Q59	17,58	14,578	,396	,235	,702
15FQ+_FG_Q84	18,51	15,051	,193	,083	**,739**
15FQ+_FG_Q108	17,44	15,497	,282	,117	,717
15FQ+_FG_Q109	17,92	13,893	,385	,193	,706
15FQ+_FG_Q133	17,48	14,109	,557	,377	,682
15FQ+_FG_Q134	17,36	16,172	,224	,194	,722
15FQ+_FG_Q158	17,47	14,817	,407	,264	,702
15FQ+_FG_Q159	17,38	15,944	,227	,099	,722
15FQ+_FG_Q183	17,29	16,309	,238	,126	,721
15FQ+_FG_Q184	17,64	13,455	,543	,371	,679

Table 4.23b displays the inter-item correlations for the factor G subscale.

Table 4.23a and Table 4.23b show a somewhat more coherent set of items which tend to respond in relatively more unison to systematic differences in a single underlying latent variable than was the case for the subscales analysed thus far. This can be seen in the still modest but somewhat higher item-total correlations and squared multiple correlations (Table 4.23a) and the still modest but somewhat higher inter-item correlations (although still at times negative) in Table 4.23b. A substantial increase in the subscale Cronbach alpha occurs only if one of the subscale items (Q84) were deleted. This, along with the small item-total correlation and squared multiple correlation values associated with this item, suggests the need to delete this item. Under normal circumstances Q84 would have been deleted. The deletion of Q84 would have more clearly revealed problems with additional items that are at present not portrayed as clear cut problematic items in Tables 4.23a and 4.23b.

TABLE 4.24b

INTER-ITEM CORRELATION MATRIX: FACTOR G

	15FQ+_fG_Q9	15FQ+_fG_Q34	15FQ+_fG_Q59	15FQ+_fG_Q84	15FQ+_fG_Q108	15FQ+_fG_Q109	15FQ+_fG_Q133	15FQ+_fG_Q134	15FQ+_fG_Q158	15FQ+_fG_Q159	15FQ+_fG_Q183	15FQ+_fG_Q184
15FQ+_fG_Q9	1,000	,357	,324	,165	,238	,282	,296	,049	,202	,095	,075	,383
15FQ+_fG_Q34	,357	1,000	,164	,020	,148	,285	,321	,230	,350	,123	,236	,314
15FQ+_fG_Q59	,324	,164	1,000	,204	,216	,209	,376	,049	,255	,094	,067	,208
15FQ+_fG_Q84	,165	,020	,204	1,000	,059	,137	,165	-,023	,089	,136	,047	,099
15FQ+_fG_Q108	,238	,148	,216	,059	1,000	,143	,183	,143	,080	,097	,034	,254
15FQ+_fG_Q109	,282	,285	,209	,137	,143	1,000	,206	,075	,152	,134	,096	,359
5FQ+_fG_Q133	,296	,321	,376	,165	,183	,206	1,000	,259	,420	,185	,231	,421
15FQ+_fG_Q134	,049	,230	,049	-,023	,143	,075	,259	1,000	,070	-,048	,249	,274
15FQ+_fG_Q158	,202	,350	,255	,089	,080	,152	,420	,070	1,000	,136	,206	,299
15FQ+_fG_Q159	,095	,123	,094	,136	,097	,134	,185	-,048	,136	1,000	,011	,234
15FQ+_fG_Q183	,075	,236	,067	,047	,034	,096	,231	,249	,206	,011	1,000	,141
15FQ+_fG_Q184	,383	,314	,208	,099	,254	,359	,421	,274	,299	,234	,141	1,000

The dimensionality analysis results reported in Table 4.7a would suggest that if the deletion of poor items were an option, this procedure would have resulted in the sequential deletion of five of the items. The seven items that load on the first factor would have been retained. The foregoing argument explains the relatively satisfactory Cronbach alpha (,725) of this factor reported in Table 4.18.

4.4.1.7 Item analysis: factor H

Table 4.25a provides more detailed results of the item analysis for the Retiring-Socially bold subscale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.25a

RELIABILITY ANALYSIS OF THE FACTOR H SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FH_Q10	14,48	25,126	,435	,235	,735
15FQ+_FH_Q11	14,00	26,437	,406	,276	,749
15FQ+_FH_Q35	14,33	25,388	,435	,294	,745
15FQ+_FH_Q36	14,04	25,611	,479	,370	,741
15FQ+_FH_Q60	13,70	28,220	,322	,140	,758
15FQ+_FH_Q61	14,79	26,284	,337	,173	,757

15FQ+_FH_Q85	14,04	25,482	,477	,361	,741
15FQ+_FH_Q86	13,82	27,125	,387	,176	,752
15FQ+_FH_Q110	14,58	26,369	,311	,126	,761
15FQ+_FH_Q135	14,41	24,585	,487	,284	,739
15FQ+_FH_Q160	14,24	26,052	,395	,185	,750
15FQ+_FH_Q185	14,18	26,056	,371	,237	,753

Table 4.25b displays the inter-item correlations for the factor H subscale.

TABLE 4.25b

INTER-ITEM CORRELATION MATRIX: FACTOR H

	15FQ+_fH Q10	15FQ+_fH_Q11	15FQ+_fH_Q35	15FQ+_fH_Q36	15FQ+_fH_Q60	15FQ+_fH_Q61	15FQ+_fH_Q85	15FQ+_fH_Q86	15FQ+_fH_Q110	15FQ+_fH_Q135	15FQ+_fH_Q160	15FQ+_fH_Q185
15FQ+_fH_Q10	1,000	,239	,285	,354	,206	,246	,334	,217	,108	,279	,180	,124
15FQ+_fH_Q11	,239	1,000	,449	,304	,144	,197	,225	,226	,201	,150	,184	,072
15FQ+_fH_Q35	,285	,449	1,000	,225	,248	,178	,188	,191	,223	,259	,230	,114
15FQ+_fH_Q36	,354	,304	,225	1,000	,140	,164	,541	,268	,166	,281	,197	,148
15FQ+_fH_Q60	,206	,144	,248	,140	1,000	,095	,242	,268	,166	,281	,197	,148
15FQ+_fH_Q61	,246	,197	,178	,164	,095	1,000	,142	,139	,085	,362	,177	,172
5FQ+_fH_Q85	,334	,225	,188	,541	,242	,142	1,000	,209	,166	,293	,242	,219
15FQ+_fH_Q86	,217	,226	,191	,268	,181	,139	,209	1,000	,182	,226	,170	,288
15FQ+_fH_Q110	,108	,201	,223	,166	,126	,085	,166	,182	1,000	,177	,190	,249
15FQ+_fH_Q135	,279	,150	,259	,281	,180	,362	,293	,226	,177	1,000	,286	,304
15FQ+_fH_Q160	,180	,184	,230	,197	,131	,177	,242	,170	,190	,286	1,000	,315
15FQ+_fH_Q185	,124	,072	,114	,148	,226	,172	,219	,288	,249	,303	,315	1,000

Table 4.25a and Table 4.25b also reveal a somewhat more coherent set of items which tends to respond in somewhat more unison to systematic differences in a single underlying latent variable than was the case for the first five subscales analysed thus far (excluding factor G). This can be seen in the still modest but somewhat higher item-total correlations and squared multiple correlations (Table 4.25a) and the modest but somewhat higher inter-item correlations in Table 4.23b. The subscale Cronbach alpha would decrease for all the subscale items if any one of them were deleted. Despite this the small-moderate item-total correlations and squared multiple correlations associated with these items, point to the fact that the items are not without problems. The dimensionality analysis results reported in paragraph 4.3.6.7 and in Table 4.8b suggest that a single factor underlying subscale H could possibly be assumed. Although reasonable factor loadings are obtained if a single factor is extracted (all factor loadings are higher than 0,30 on the single extracted factor), the extracted factor structure nonetheless fails to satisfactorily reproduce the observed inter-item correlation

matrix for the subscale (a moderately large percentage (33%) of non-redundant residuals had absolute values greater than 0,05). A multiple factor structure seems to provide a more accurate portrayal of the actual state of affairs. The results shown in Tables 4.25a and 4.25b are in line with the results reported in Table 4.8a and the marginally satisfactory Cronbach alpha (,765) reported in Table 4.18.

4.4.1.8 Item analysis: factor I

Table 4.26a provides more detailed results of the item analysis for the Tough-Tender minded sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.26a

RELIABILITY ANALYSIS OF THE FACTOR I SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FI_Q12	12,90	19,182	,351	,176	,629
15FQ+_FI_Q37	13,32	18,977	,352	,244	,628
15FQ+_FI_Q62	13,43	18,671	,382	,217	,623
15FQ+_FI_Q87	13,42	19,262	,306	,159	,637
15FQ+_FI_Q111	13,29	19,024	,333	,243	,632
15FQ+_FI_Q112	12,57	20,580	,276	,148	,643
15FQ+_FI_Q136	13,43	19,880	,229	,134	,651
15FQ+_FI_Q137	13,10	18,762	,387	,277	,622
15FQ+_FI_Q161	13,07	19,919	,218	,102	,654
15FQ+_FI_Q162	13,37	19,285	,311	,205	,636
15FQ+_FI_Q186	12,40	21,891	,137	,084	**,659**
15FQ+_FI_Q187	12,43	20,963	,294	,130	,643

Table 4.26b below displays the inter-item correlations for the factor I subscale.

Table 4.26a and Table 4.26b show a worrisome lack of coherence in the set of items which were all designed to reflect factor I. The low item-total correlations, the low squared multiple correlations (Table 4.26a) and the low (and at times negative) inter-item correlations in Table 4.26b indicate that the items comprising this subscale do not respond in unison to systematic differences in a single underlying latent variable. A substantial increase in the subscale Cronbach alpha if Q186 were deleted, along with the small item-total correlation and squared multiple correlation values associated with this item, point to the need to delete this item. If this item were deleted, further problematic items would be flagged in terms of the same criteria. The dimensionality analysis results reported in Table 4.9a would explain that if the deletion of poor items were an option, this procedure would have resulted in the sequential deletion of all but the four items that load on the first factor. The results shown in Tables 4.26a and 4.26b explain the unsatisfactory Cronbach alpha (,658) of this factor reported in Table 4.18.

TABLE 4.26b

INTER-ITEM CORRELATION MATRIX: FACTOR I

	15FQ+_fI_Q12	15FQ+_fI_Q37	15FQ+_fI_Q62	15FQ+_fI_Q87	15FQ+_fI_Q111	15FQ+_fI_Q112	15FQ+_fI_Q136	15FQ+_fI_Q137	15FQ+_fI_Q161	15FQ+_fI_Q162	15FQ+_fI_Q186	15FQ+_fI_Q187
15FQ+_fI_Q12	1,000	,212	,224	,232	,152	,184	,168	,116	,074	,131	,047	,266
15FQ+_fI_Q37	,212	1,000	,158	,167	,200	,089	,093	,442	,069	,075	,096	,177
15FQ+_fI_Q62	,224	,158	1,000	,290	,114	,175	,312	,101	,187	,119	,067	,114
15FQ+_fI_Q87	,232	,167	,290	1,000	,001	,055	,189	,157	,146	,124	,005	,138
15FQ+_fI_Q111	,152	,200	,114	,001	1,000	,216	,078	,254	,093	,400	,085	,096
15FQ+_fI_Q112	,184	,089	,175	,055	,216	1,000	,019	,197	,098	,120	,233	,100
5FQ+_fI_Q136	,168	,093	,312	,189	,078	,019	1,000	,069	-,011	,128	,020	,064
15FQ+_fI_Q137	,116	,442	,101	,157	,254	,197	,069	1,000	,193	,127	,109	,194
15FQ+_fI_Q161	,074	,069	,187	,146	,093	,098	-,011	,193	1,000	,175	-,014	,076
15FQ+_fI_Q162	,131	,075	,119	,124	,400	,120	,128	,127	,175	1,000	,004	,126
15FQ+_fI_Q186	,047	,096	,067	,005	,085	,233	,020	,109	-,014	,004	1,000	,162
15FQ+_fI_Q187	,266	,177	,144	,138	,096	,100	,064	,194	,076	,126	,162	1,000

4.4.1.9 Item analysis: factor L

Table 4.27a provides more detailed results of the item analysis for the Trusting-Suspicious sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.27a

RELIABILITY ANALYSIS OF THE FACTOR L SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FL_Q13	7,77	18,727	,272	,145	,691
15FQ+_FL_Q14	8,03	16,657	,523	,360	,646
15FQ+_FL_Q38	8,48	18,967	,325	,197	,681
15FQ+_FL_Q39	7,82	17,033	,510	,353	,649
15FQ+_FL_Q63	8,49	19,226	,271	,170	,689

15FQ+_FL_Q64	8,71	19,724	,291	,127	,686
15FQ+_FL_Q88	8,35	18,128	,384	,250	,672
15FQ+_FL_Q89	8,67	19,181	,394	,359	,674
15FQ+_FL_Q113	8,51	18,551	,397	,346	,671
15FQ+_FL_Q138	7,35	20,753	,083	,070	**,713**
15FQ+_FL_Q163	7,65	18,113	,378	,222	,673
15FQ+_FL_Q188	8,95	21,593	,093	,083	**,703**

Table 4.27b below displays the inter-item correlations for the factor L subscale.

TABLE 4.27b

INTER-ITEM CORRELATION MATRIX: FACTOR L

	15FQ+_fL_Q13	15FQ+_fL_Q14	15FQ+_fL_Q38	15FQ+_fL_Q39	15FQ+_fL_Q63	15FQ+_fL_Q64	15FQ+_fL_Q88	15FQ+_fL_Q89	15FQ+_fL_Q113	15FQ+_fL_Q138	15FQ+_fL_Q163	15FQ+_fL_Q188
15FQ+_fL_Q13	1,000	,193	,109	,199	,124	,168	,119	,043	,082	,061	,304	-,097
15FQ+_fL_Q14	,193	1,000	,348	,491	,169	,143	,295	,192	,314	,153	,213	,105
15FQ+_fL_Q38	,109	,348	1,000	,339	-,046	,152	,120	,137	,176	,109	,159	,081
15FQ+_fL_Q39	,199	,491	,339	1,000	,187	,157	,199	,154	,201	,133	,379	,047
15FQ+_fL_Q63	,124	,169	-,046	,187	1,000	,176	,199	,247	,211	-,057	,220	-,077
15FQ+_fL_Q64	,168	,143	,152	,157	,176	1,000	,189	,227	,141	,000	,120	,143
5FQ+_ fL_Q88	,119	,295	,120	,199	,199	,189	1,000	,400	,342	-,043	,125	,162
15FQ+_fL_Q89	,043	,192	,137	,154	,247	,227	,400	1,000	,523	-,011	,105	,087
15FQ+_fL_Q113	,082	,314	,176	,201	,211	,141	,342	,523	1,000	-,082	,132	,047
15FQ+_fL_Q138	,061	,153	,109	,133	-,057	,000	-,043	-,011	-,082	1,000	,107	,064
15FQ+_fL_Q163	,304	,213	,159	,379	,220	,120	,125	,105	,132	,107	1,000	-,012
15FQ+_fL_Q188	-,097	,105	,081	,047	-,077	,143	,162	,087	,047	,064	-,012	1,000

Table 4.27a and Table 4.27b show a somewhat incoherent set of items which, although they were all written to measure factor L, nonetheless do not seem to respond in unison to systematic differences in a single underlying latent variable. This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.27a) and the low (and at times negative) inter-item correlations in Table 4.27b. Substantial increases would occur in the subscale Cronbach alpha if the two of the subscale items (Q138 and Q188) were deleted. This along with the small item-total correlation and squared multiple correlation values associated with these two items would normally warrant deleting these items from the subscale. Deleting these two items from subscale L would reveal additional items as problematic. The dimensionality analysis results reported in Table 4.10a would explain why these additional problematic items appear. If the deletion of poor items were an option, this procedure would have resulted in the sequential deletion of all but the four items that load on

the first, dominant factor that explains the most variance. The results shown in Tables 4.27a and 4.27b explain the unsatisfactory Cronbach alpha (,699) of this factor reported in Table 4.18.

4.4.1.10 Item analysis: factor M

Table 4.28a provides more detailed results of the item analysis for the Concrete-Abstract subscale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B. Table 4.28b below displays the inter-item correlations for the factor M subscale.

Table 4.28a and Table 4.28b show a rather disconcerting lack of coherence in the set of items designed to measure factor M. Although one would in terms of the design intention expect them to respond in unison to systematic differences in a single underlying latent variable, the item statistics seem to indicate this is not the case. The low item-total correlations, the low squared multiple correlations (Table 4.28a) and the low (and quite often low negative) inter-item correlations in Table 4.28b indicate a somewhat disjointed set of items. Substantial increases in the subscale Cronbach alpha if two of the subscale items (Q90 and Q115) were deleted, along with the small item-total correlation and squared multiple correlation values associated with these two items, suggest the need to delete these items. The dimensionality analysis results reported in Table 4.11a moreover suggest that if the deletion of poor items were an option, the deletion of these two items would have resulted in the sequential deletion of all but the five items that load on the dominant first factor that explains the most variance in the subscale data. The results shown in Tables 4.28a and 4.28b explain the unsatisfactory Cronbach alpha (,558) of this factor reported in Table 4.18.

TABLE 4.28a

RELIABILITY ANALYSIS OF THE FACTOR M SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FM_Q15	9,68	12,695	,310	,141	,514
15FQ+_FM_Q40	9,60	13,150	,231	,108	,536
15FQ+_FM_Q65	8,79	14.007	,193	,143	,544
15FQ+_FM_ Q90	10,12	14,951	,088	,081	**,561**
15FQ+_FM_Q114	8,83	13,608	,238	,145	,534

15FQ+_FM_Q115	8,92	14,101	,132	,074	**,559**
15FQ+_FM_Q139	9,96	13,019	,373	,199	,503
15FQ+_FM_Q140	10,14	14,830	,109	,070	,558
15FQ+_FM_Q164	9,73	13,131	,265	,132	526
15FQ+_FM_Q165	9,86	13,544	,265	,103	,528
15FQ+_FM_Q189	9,09	14,255	,185	,080	,545
15FQ+_FM_Q190	9,20	12,913	,289	,125	,520

TABLE 4.28b

INTER-ITEM CORRELATION MATRIX: FACTOR M

	15FQ+_fM_Q15	15FQ+_fM_Q40	15FQ+_fM Q65	15FQ+_fM_Q90	15FQ+_fM_Q114	15FQ+_fM_Q115	15FQ+_fM_Q139	15FQ+_fM_Q140	15FQ+_fM_Q164	15FQ+_fM_Q165	15FQ+_fM_Q189	15FQ+_fM_Q190
15FQ+_fM_Q15	1,000	,146	,056	,093	,036	,125	,217	,066	,254	,069	,176	,144
15FQ+_fM_Q40	,146	1,000	,010	,135	,047	-,013	,257	,034	,124	,111	,153	,081
15FQ+_fM_Q65	,056	,010	1,000	-,084	,321	,100	,061	-,042	,116	,113	-,014	,176
15FQ+_fM_Q90	,093	,135	-,084	1,000	,050	-,058	,019	,189	,008	,070	-,023	,027
15FQ+_fM_Q114	,036	,047	,321	,050	1,000	,056	,075	,023	,090	,163	,021	,207
15FQ+_fM_Q115	,125	-,013	,100	-,058	,056	1,000	,021	-,067	,020	,055	,127	,198
15FQ+_fM_Q139	,217	,257	,061	,019	,075	,021	1,000	,146	,235	,247	,165	,181
15FQ+ fM_Q140	,066	,034	-,042	,189	,023	-,067	,146	1,000	,116	,049	,000	,039
15FQ+_fM_Q164	,254	,124	,116	,008	,090	,020	,235	,116	1,000	,165	,016	,045
15FQ+_fM_Q165	,069	,111	,113	,070	,163	,055	,247	,049	,165	1,000	,071	,098
15FQ+_fM_Q189	,176	,153	-,014	-,023	,021	,127	,165	,000	,016	,071	1,000	,101
15FQ+_fM_Q190	,144	,081	,176	,027	,207	,198	,181	,039	,045	,098	,101	1,000

4.4.1.11 Item analysis: factor N

Table 4.29a provides more detailed results of the item analysis for the Direct-Restrained sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.29a

RELIABILITY ANALYSIS OF THE FACTOR N SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FN_Q16	18,81	10,288	,272	,113	,655
15FQ+_FN_Q17	17,98	12,266	.228	,151	,653
15FQ+_FN_Q41	18,82	10,175	,302	,196	,647
15FQ+_FN_Q42	18,67	9,771	,388	,209	,625
15FQ+_FN_Q66	18,03	11,674	,318	,230	,641
15FQ+_FN_Q67	18,17	10,836	,396	,182	,625

15FQ+_FN_Q91	18,02	11,462	,438	,286	,629
15FQ+_FN_Q92	18,18	10,839	,388	,193	,626
15FQ+_FN_Q116	18,07	11,341	,396	,300	,630
15FQ+_FN_Q141	18,00	12,283	,191	,145	,656
15FQ+_FN_Q166	18,22	11,537	,211	,193	,655
15FQ+_FN_Q191	18,11	11,458	,286	,237	,643

Table 4.29b below displays the inter-item correlations for the factor N subscale.

TABLE 4.29b

INTER-ITEM CORRELATION MATRIX: FACTOR N

	15FQ+_fN_Q16	15FQ+_fN_Q17	15FQ+_fN Q41	15FQ+_fN_Q42	15FQ+_fN_Q66	15FQ+_fN_Q67	15FQ+_fN_Q91	15FQ+_fN_Q92	15FQ+_fN_Q116	15FQ+_fN_Q141	15FQ+_fN_Q166	15FQ+_fN_Q191
15FQ+_fN_Q16	1,000	,117	,172	,181	,019	,183	,183	,202	,089	,075	,025	,153
15FQ+_fN_Q17	,117	1,000	,008	,124	,201	,038	,287	,178	,067	,097	,-,016	,270
15FQ+_fN_Q41	,172	,008	1,000	,348	,075	,239	,173	,160	,178	,000	,076	-,041
15FQ+_fN_Q42	,181	,124	,348	1,000	,145	,221	,119	,178	,258	,087	,171	,059
15FQ+_fN_Q66	,019	,201	,075	,145	1,000	,198	,261	,222	,198	,272	,051	,343
15FQ+_fN_Q67	,183	,038	,239	,221	,198	1,000	,181	,193	,222	,183	,158	,207
15FQ+_fN_Q91	,183	,287	,173	,119	,261	,181	1,000	,317	,308	,221	,177	,281
15FQ+ fN_Q92	,202	,178	,160	,178	,222	,193	,317	1,000	,244	,142	,062	,248
15FQ+_fN_Q116	,089	,067	,178	,258	,198	,222	,308	,244	1,000	-,026	,408	,087
15FQ+_fN_Q141	,075	,097	,000	,087	,272	,183	,221	,142	-,026	1,000	-,036	,167
15FQ+_fN_Q166	,025	-,016	,076	,171	,051	,158	,177	,062	,408	-,036	1,000	,079
15FQ+_fN_Q191	,153	,270	-,041	,059	,343	,207	,281	,248	,087	,167	,079	1,000

Table 4.29a and Table 4.29b show a somewhat incoherent set of items which, although they were all meant to measure factor N, nonetheless do not seem to respond in unison to systematic differences in a single underlying latent variable. This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.29a) and the low (and at times negative) inter-item correlations in Table 4.29b. Somewhat surprisingly no increases in the subscale Cronbach alpha could be affected by the deletion of individual items. The small item-total correlations, the small squared multiple correlations, the small inter-item correlations and the low Cronbach alpha, however, indicate that this should not be interpreted that all is well with subscale N. The item statistics associated with the subscale N items indicate that these are generally poor items that do not coherently reflect the underlying construct they purport to measure.

4.4.1.12 Item analysis: factor O

Table 4.30a provides more detailed results of the item analysis for the Confident-Self-doubting sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.30a

RELIABILITY ANALYSIS OF THE FACTOR O SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FO_Q18	10,47	22,092	,127	,096	**,637**
15FQ+_FO_Q43	11,10	21,098	,229	,132	,620
15FQ+_FO_Q68	10,83	19,122	,455	,345	,575
15FQ+_FO_Q93	11,28	21,887	,154	,064	**,632**
15FQ+_FO_Q117	11,17	20,264	,332	,187	,600
15FQ+_FO_Q118	10,62	21,828	,132	,087	**,638**
15FQ+_FO Q142	10,68	20,625	,270	,169	,612
15FQ+_FO_Q143	11,54	21,924	,225	,118	,620
15FQ+_FO Q167	10,70	19,102	,466	,378	,573
15FQ+_FO_Q168	10,59	20,952	,239	,101	,618
15FQ+_FO_Q192	10,95	20,006	,338	,181	,599
15FQ+_FO Q193	10,46	20,250	,359	,168	,596

Table 4.30b below displays the inter-item correlations for the factor O subscale.

TABLE 4.30b

INTER-ITEM CORRELATION MATRIX: FACTOR O

	15FQ+_fO_Q18	15FQ+_fO_Q43	15FQ+_fO Q68	15FQ+_fO_Q93	15FQ+_fO_Q117	15FQ+_fO_Q118	15FQ+_fO_Q142	15FQ+_fO_Q143	15FQ+_fO_Q167	15FQ+_fO_Q168	15FQ+_fO_Q192	15FQ+_fO_Q193
15FQ+_FO_Q18	1,000	,014	,138	,064	,005	,182	-,034	,007	,138	,035	-,039	,132
15FQ+_fO_Q43	,014	1,000	,173	,040	,061	,065	-,033	,053	,137	,128	,255	,238
15FQ+_fO_Q68	,138	,173	1,000	,094	,197	,040	,251	,149	,537	,062	,293	223
15FQ+_fO_Q93	,064	,040	,094	1,000	,036	,015	,008	,149	,079	,166	,118	,033
15FQ+_fO_Q117	,005	,061	,197	,036	1,000	,026	,199	,321	,321	,215	,169	,178
15FQ+_fO_Q118	,182	,065	,040	,015	,026	1,000	,102	-,065	-,007	,116	,127	,050
5FQ+_ fO_Q142	-,034	-,033	,251	,008	,199	,102	1,000	,210	,266	,073	,106	,200
15FQ+ fO_Q143	,007	,053	,149	,149	,231	-,065	,210	1,000	,139	,099	,037	,118
15FQ+_fO_Q167	,138	,137	,537	,079	,321	-,007	,266	,139	1,000	,065	,235	,297
15FQ+_fO_Q168	,035	,128	,062	,166	,215	,116	,073	,099	,065	1,000	,146	,098
15FQ+_fO_Q192	-,039	,255	,293	,118	,169	,127	,106	,037	,235	,146	1,000	,173
15FQ+_fO_Q193	,132	,238	,223	,033	,178	,050	,200	,118	,297	,098	,173	1,000

Table 4.30a and Table 4.30b show a somewhat incoherent set of items which, although they were all meant to measure factor O, nonetheless do not seem to respond in unison to systematic differences in a single underlying latent variable. This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.30a) and the low (and at times negative) inter-item correlations in Table 4.30b. Substantial increases in the subscale Cronbach alpha if three of the subscale items (Q18, Q93 and Q118) were deleted, along with the small item-total correlation and squared multiple correlation values associated with these items, point to the need to delete these items. Under normal circumstances one would delete such items to create a psychometrically satisfactory measure of the specific source trait. The dimensionality analysis results reported in Table 4.13a suggest that if the deletion of poor items were an option, this would have resulted in the sequential deletion of all but the three items that load on the first factor. The results shown in Tables 4.30a and 4.30b, along with the foregoing argument, explain the unsatisfactory Cronbach alpha (,631) of this factor reported in Table 4.18.

4.4.1.13 Item analysis: factor Q1

Table 4.31a provides more detailed results of the item analysis for the Conventional-Radical sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

TABLE 4.31a

RELIABILITY ANALYSIS OF THE FACTOR Q1 SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FQ^1_Q19	8,90	20,512	,311	,165	,636
15FQ+_FQ^1_Q20	9,18	20,464	,350	,198	,629
15FQ+_FQ^1_Q44	8,75	21,073	,279	,216	,641
15FQ+_FQ^1_Q45	9,18	21,281	,238	,196	,649
15FQ+_FQ^1_Q69	9,30	19,535	,466	,365	,607
15FQ+_FQ^1_Q70	9,18	20,764	,333	,176	,632
15FQ+_FQ^1_Q94	8,63	21,017	,304	,171	,637
15FQ+_FQ^1_Q95	9,39	22,030	,175	,067	,658
15FQ+_FQ^1_Q119	9,27	21,881	,184	,076	,657
15FQ+_FQ^1_Q144	9,49	20,609	,375	,297	,626
15FQ+_FQ^1_Q169	9,33	21,821	,190	,078	,656
15FQ+_FQ^1_Q194	9,50	20,701	,385	,203	,625

Table 4.31b below displays the inter-item correlations for the factor Q1 subscale.

TABLE 4.31b

INTER-ITEM CORRELATION MATRIX: FACTOR Q1

	15FQ+_f Q^1__Q19	15FQ+_f Q^1__Q20	15FQ+_f Q^1_ Q44	15FQ+_f Q^1__Q45	15FQ+ fQ^1__Q69	15FQ+_fQ^1__Q70	15FQ+_fQ^1__Q94	15FQ+_f Q^1_Q95	15FQ+_fQ^1_Q119	15FQ+_fQ^1_Q144	15FQ+_fQ^1_Q169	15FQ+_fQ^1_Q194
15FQ+_fQ1_Q19	1,000	,104	,347	,088	,186	,137	,194	,022	,046	,136	,134	,196
15FQ+_fQ1_Q20	,104	1,000	,154	,330	,236	,150	,164	,123	,154	,152	,101	,094
15FQ+_fQ1_Q44	,347	,154	1,000	-,051	,141	,082	,302	-,017	,039	,094	,140	,193
15FQ+_fQ1_Q45	,088	,330	-,051	1,000	,140	,157	-,043	,075	,166	,159	,009	,207
15FQ+_fQ1_Q69	,186	,236	,141	,140	1,000	,261	,229	,159	,019	,517	,199	,252
15FQ+_fQ1_Q70	,137	,150	,082	,157	,261	1,000	,165	,161	,161	,130	-,011	,313
5FQ+_ fQ1_Q94	,194	,164	,302	-,043	,229	,165	1,000	,035	,031	,219	,118	,141
15FQ+ fQ1_Q95	,022	,123	-,017	,075	,159	,161	,035	1,000	,120	,098	,000	,154
15FQ+_fQ1_Q119	,046	,154	,039	,166	,019	,161	,031	,120	1,000	,064	,015	,155
15FQ+_fQ1_Q144	,136	,152	,094	,159	,517	,130	,219	,098	,064	1,000	,181	,132
15FQ+_fQ1_Q169	,134	,101	,140	,009	,199	-,011	,118	,000	,015	,181	1,000	,103
15FQ+_fQ1_Q194	,196	,094	,193	,207	,252	,313	,141	,154	,155	,132	,103	1,000

Table 4.31a and Table 4.31b show a somewhat incoherent set of items which, although they were all meant to measure factor Q1, nonetheless do not seem to respond in unison to systematic differences in a single underlying latent variable. This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.31a) and the low (and at times negative) inter-item correlations in Table 4.31b. Despite this trend no increase in the subscale Cronbach alpha would be achieved if any of the subscale items were deleted. The small item-total correlations and squared multiple correlations associated with the majority of the subscale items (excluding Q69) nonetheless point to the problematic nature of these items. The results shown in Tables 4.31a and 4.31b explain the unsatisfactory Cronbach alpha (,658) of this factor reported in Table 4.18.

4.4.1.14 Item analysis: factor Q2

Table 4.32a provides more detailed results of the item analysis for the Group orientated-Self sufficient sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

Table 4.32b below displays the inter-item correlations for the factor Q2 subscale.

TABLE 4.32a

RELIABILITY ANALYSIS OF THE FACTOR Q2 SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FQ2_Q21	5,39	14,898	,151	,093	**,608**
15FQ+_FQ2_Q46	6,68	15,842	,041	,062	**,622**
15FQ+_FQ2_Q71	5,83	13,633	,272	,125	,585
15FQ+_FQ2_Q96	6,53	14,058	,319	,127	,574
15FQ+_FQ2_Q120	6,69	15,340	,132	,054	**,608**
15FQ+_FQ2_Q121	6,32	13,161	,395	,202	,555
15FQ+_FQ2_Q145	6.67	14,921	,212	,181	,595
15FQ+_FQ2_Q146	6,41	13,676	,322	,208	,573
15FQ+_FQ2_Q170	6,71	14,605	,314	,211	,579
15FQ+_FQ2_Q171	6,13	13,791	,246	,168	,591
15FQ+_FQ2_Q195	6,83	15,020	,346	,207	,581
15FQ+_FQ2_Q196	6,34	13,175	,401	,210	,554

Table 4.32a and Table 4.32b show a somewhat incoherent set of items which, although they were all meant to measure factor Q2, nonetheless do not seem to respond in unison to systematic differences in a single underlying latent variable. This is apparent from the low item-total correlations, the low squared multiple correlations (Table 4.32a) and the low (and at times negative) inter-item correlations in Table 4.32b.

TABLE 4.32b

INTER-ITEM CORRELATION MATRIX: FACTOR Q2

	15FQ+_f Q^2__Q21	15FQ+_f Q^2__Q46	15FQ+_f Q^2_ Q71	15FQ+_f Q^2__Q96	15FQ+ fQ^2__Q120	15FQ+_fQ^2_Q121	15FQ+_fQ^2_Q145	15FQ+_f Q^2_Q146	15FQ+_fQ^2_Q170	15FQ+_fQ^2_Q171	15FQ+_fQ^2_Q195	15FQ+_fQ^2_Q196
15FQ+_fQ2_Q21	1,000	-,050	,068	,067	,002	,051	-,015	,072	,173	,246	-,001	,065
15FQ+_fQ2_Q46	-,050	1,000	,010	,073	,107	,044	,020	-,047	,132	-,070	,155	-,035
15FQ+_fQ2_Q71	,068	,010	1,000	,135	,030	,222	,001	,230	,087	,119	,177	,198
15FQ+_fQ2_Q96	,067	,073	,135	1,000	,034	,200	,141	,102	,208	,180	,215	,208
15FQ+_fQ2_Q120	,002	,107	,030	,034	1,000	,174	,013	,087	,41	,015	,139	,056
15FQ+_fQ2_Q121	,051	,044	,222	,200	,174	1,000	,169	,270	,050	,199	,210	,245
5FQ+_ fQ2_Q145	-,015	,020	,001	,141	,013	,169	1,000	,328	,170	-,064	,118	,193
15FQ+ fQ2_Q146	,072	-,047	,230	,102	,087	,270	,328	1,000	,058	,066	,107	,225
15FQ+_fQ2_Q170	,173	,132	,087	,208	,041	,050	,170	,058	1,000	,127	,335	,225
15FQ+_fQ2 Q171	,246	-,070	,119	,180	,015	,199	-,064	,066	,127	1,000	,043	,243
15FQ+_fQ2_Q195	-,001	,155	,177	,215	,139	,210	,118	,107	,335	,043	1,000	,239
15FQ+_fQ2_Q196	,065	-,035	,198	,208	,056	,245	,193	,225	,250	,243	,239	1,000

Substantial increases in the subscale Cronbach alpha if three of the subscale items (Q21, Q46 and Q120) were deleted, along with the small item-total correlation and squared multiple correlation values associated with these items, point to the need to delete these items. If these items were deleted, the dimensionality analysis results reported in Table 4.15a suggest that this would result in the sequential deletion of all but the two items that load on the dominant first factor that explains the most variance in the subscale data. The results shown in Tables 4.32a and 4.32b explain the unsatisfactory Cronbach alpha (,607) of this factor reported in Table 4.18.

4.4.1.15 Item analysis: factor Q3

Table 4.33a provides more detailed results of the item analysis for the Informal-Self disciplined sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B. Table 4.33b below displays the inter-item correlations for the factor Q3 subscale.

TABLE 4.33a

RELIABILITY ANALYSIS OF THE FACTOR Q3 SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FQ3_Q22	17,74	10,700	,359	,281	,629
15FQ+_FQ3_Q23	17,73	11,023	,273	,171	,640
15FQ+_FQ3_Q46	17,97	10,520	,207	,097	,651
15FQ+_FQ3_Q48	17,74	10,844	,332	,236	,633
15FQ+_FQ3_Q72	18,18	9,975	,227	,142	,654
15FQ+_FQ3_Q73	17,72	10,445	,532	,363	,613
15FQ+_FQ3_Q97	17,82	10,572	,313	,144	,632
15FQ+_FQ3_Q98	19,09	9,68	,275	,084	,644
15FQ+_FQ3_Q122	17,73	11,063	,245	,168	,643
15FQ+_FQ3_Q147	17,82	10,367	,356	,246	,625
15FQ+_FQ3_Q172	18,30	9,429	,318	,184	,634
15FQ+_FQ3_Q197	18,00	9,608	,402	,228	,613

Table 4.33a and Table 4.33b show a somewhat incoherent set of items which, although they were all meant to measure factor Q3, nonetheless do not seem to respond in unison to systematic differences in a single underlying latent variable.

TABLE 4.33b

INTER-ITEM CORRELATION MATRIX: FACTOR Q3

	15FQ+_f Q^3__Q22	15FQ+_f Q^3__Q23	15FQ+_f Q^3 Q47	15FQ+_f Q^3__Q48	15FQ+ fQ^3__Q72	15FQ+_fQ^3_Q73	15FQ+_fQ^3_Q97	15FQ+_f Q^3_Q98	15FQ+_fQ^3_Q122	15FQ+_fQ^3_Q147	15FQ+_fQ^3_Q172	15FQ+_fQ^3_Q197
15FQ+_fQ3_Q22	1,000	,291	,052	,280	,030	,364	,214	,123	,191	,360	,119	,168
15FQ+_fQ3_Q23	,291	1,000	,215	,071	,028	,244	,185	,114	,120	,089	,140	,072
15FQ+_fQ3_Q47	,052	,215	1,000	-,025	,146	,091	,081	,075	,092	,125	,141	,093
15FQ+_fQ3_Q48	,280	,071	-,025	1,000	-,008	,311	,174	,158	,181	,152	,278	,278
15FQ+_fQ3_Q72	,030	,028	,146	-,008	1,000	,274	,119	,118	,168	,032	,137	,147
15FQ+_fQ3_Q73	,364	,244	,091	,311	,274	1,000	,327	,150	,284	,317	,208	,327
5FQ+_ fQ3_Q97	,214	,185	,081	,174	,119	,327	1,000	,104	,084	,206	,117	,192
15FQ+ fQ3_Q98	,123	,114	,075	,158	,118	,150	,104	1,000	,094	,130	,198	,182
15FQ+_fQ3_Q122	,191	,120	,092	,181	,168	,284	,084	,094	1,000	,066	-,059	,239
15FQ+_fQ3 Q147	,360	,089	,125	,152	,032	,317	,206	,130	,066	1,000	,187	,313
15FQ+_fQ3_Q172	,119	,140	,141	,278	,137	,208	,117	,198	-,059	,187	1,000	,188
15FQ+_fQ3_Q197	,168	,072	,093	,278	,147	,327	,192	,182	,239	,313	,188	1,000

This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.33a) and the low (and at times negative) inter-item correlations in Table 4.33b. Despite this trend no increase in the subscale Cronbach alpha would be achieved if any of the subscale items were deleted. The small item-total correlations and squared multiple correlations associated with the majority of the subscale items nonetheless point to the problematic nature of these items. The results shown in Tables 4.33a and 4.33b explain the unsatisfactory Cronbach alpha (,658) of this factor reported in Table 4.18. The item statistics associated with the majority of the subscale items indicate that these are poor items that do not reflect the same underlying factor as the rest in the subscale.

4.4.1.15 Item analysis: factor Q4

Table 4.34a provides more detailed results of the item analysis for the Composed-Tense driven sub-scale. The item means, standard deviations and subscale total score descriptive statistics are given in Appendix B.

Table 4.34b below displays the inter-item correlations for the factor Q**4** subscale.

TABLE 4.34a

RELIABILITY ANALYSIS OF THE FACTOR Q4 SUB-SCALE

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
15FQ+_FQ4_Q24	7,43	19,788	,233	,116	,644
15FQ+_FQ4_Q49	7,46	19,591	,289	,145	,635
15FQ+_FQ4_Q74	7,41	18,459	,421	,248	,612
15FQ+_FQ4_Q99	7,49	19,084	,374	,208	,622
15FQ+_FQ4_Q123	7,46	20,416	,203	,117	,647
15FQ+_FQ4_Q124	6,88	19,881	,156	,094	**,661**
15FQ+_FQ4_Q148	7,03	18,532	,341	,144	,625
15FQ+_FQ4_Q149	6,96	18,990	,261	,132	,641
15FQ+_FQ4_Q173	6,91	18,275	,353	,196	,623
15FQ+_FQ4_Q174	7,25	19,023	,298	,171	,633
15FQ+_FQ4_Q198	7,61	19,705	,371	,181	,628
15FQ+_FQ4_Q199	6,91	18,767	,294	,115	,634

TABLE 4.34b

INTER-ITEM CORRELATION MATRIX: FACTOR Q4

	15FQ+_fQ4__Q24	15FQ+_fQ4__Q49	15FQ+_f Q4_Q74	15FQ+_fQ4__Q99	15FQ+ fQ4__Q123	15FQ+_fQ4_Q124	15FQ+_fQ4_Q148	15FQ+_f Q4_Q149	15FQ+_fQ4_Q173	15FQ+_fQ4_Q174	15FQ+_fQ4_Q198	15FQ+_fQ4_Q199
15FQ+_fQ**4**_Q24	1,000	,214	,177	,125	,001	-,060	,106	,194	,145	,040	,131	,141
15FQ+_fQ**4**_Q49	,214	1,000	,305	,162	,-003	,088	,089	,104	,109	,115	,149	,160
15FQ+_fQ**4**_Q74	,177	,305	1,000	,278	,192	,127	,168	,117	,267	,113	,291	,150
15FQ+_fQ**4**_Q99	,125	,162	,278	1,000	,139	,016	,166	,248	,188	,284	,247	,077
15FQ+_fQ**4**_Q123	,001	-,003	,192	,139	1,000	,054	,139	-,056	,221	,198	,145	,042
15FQ+_fQ**4**_Q124	-,060	,088	,127	,016	,054	1,000	,149	,102	-,035	,082	,138	,161
5FQ+_ fQ**4**_Q148	,106	,089	,168	,166	,139	,149	1,000	,126	,253	,112	,,216	,204
15FQ+ fQ**4**_Q149	,194	,104	,117	,248	-,056	,102	,126	1,000	,121	,087	,091	,184
15FQ+_fQ**4**_Q173	,145	,109	,267	,188	,221	-,035	,253	,121	1,000	,236	,137	,172
15FQ+_fQ**4** Q174	,040	,115	,113	,284	,198	,082	,112	,087	,236	1,000	,260	,070
15FQ+_fQ**4**_Q198	,131	,149	,291	,247	,145	,138	,216	,091	,137	,260	1,000	,104
15FQ+_fQ**4**_Q199	,141	,160	,150	,077	,042	,161	,204	,184	,172	,070	,104	1,000

Table 4.34a and Table 4.34b show a somewhat inconsistent set of items which, although they were all meant to measure factor Q4, nonetheless do not seem to respond in unison to systematic differences in a single underlying latent variable. This can be seen in the low item-total correlations, the low squared multiple correlations (Table 4.34a) and the low (and at times negative) inter-item correlations in Table 4.34b. A substantial increase in the subscale Cronbach alpha would occur if the one of the subscale items (Q124) would be deleted. This,

along with the small item-total correlation and squared multiple correlation values associated with this item, point to the need to delete this item. If this item were deleted with the aim of improving the psychometric properties of the subscale, the dimensionality analysis results reported in Table 4.17a suggest that the deletion of poor items would result in the sequential deletion of all but the four items that load on the first dominant factor explaining the most variance in the subscale data. The results shown in Tables 4.34a and 4.34b in conjunction with the foregoing argument explain the unsatisfactory Cronbach alpha (,654) of this factor reported in Table 4.18.

4.5 SUMMARY OF THE ITEM ANALYSIS RESULTS

The purpose of the first part of this chapter was to report on the results obtained from the dimensionality analyses and item analyses of the 15FQ+ indicator variables to determine the success with which they represent the various personality dimensions measured by the instrument in this study. Reliability analyses were conducted for all the subscales of the 15FQ+. A variety of item statistics were calculated for the items of each subscale. When considering the basket of evidence provided by these item statistics it has to be concluded that the 15FQ+ subscales generally show a worrisome lack of coherence in the set of items which were all designed to reflect a specific source trait. The low item-total correlations, the low squared multiple correlations, the low (and at times negative) inter-item correlations and the moderate Cronbach alpha coefficients all indicate that the items comprising the various subscales do not really respond in unison to systematic differences in a single underlying latent variable. For most subscales the Cronbach alpha are below 0,70. The available item statistic evidence would thus suggest that numerous items do not successfully represent the underlying personality dimension they were meant to measure. The question could be asked whether items characterized by questionable item statistics should not be deleted. However, such an exercise would be beyond the scope of the current investigation, but such findings could be useful in future should the developers of this instrument want to re-work it to suit the South African Black population.

4.6 EVALUATION OF THE PRIMARY MEASUREMENT MODEL

The 15FQ+ is used to measure a multifaceted personality construct to which a specific meaning has been attached. Operational denotations are explicitly and intentionally used to reflect a test taker's position on each of the latent personality dimensions. Specific 15FQ+ items are assumed to serve as stimulus sets to which test takers would respond with behaviour which would be behavioural expressions of specific personality dimensions. The question that needs to be answered is to what extent this premeditated operational design succeeds in providing a valid measure of the personality construct as defined.[17]

4.6.1 VARIABLE TYPE

Since the focus of this study is on the psychometric evaluation of the 15FQ+ when used to assess the personality of Black South African managers the ideal would have been to perform a confirmatory factor analysis on the individual items. If the individual 15FQ+ items were used to represent the latent variables in a measurement model, they would have to be treated as ordinal variables due to the nature of the three-point scale used to capture responses (Jöreskog & Sörbom, 1996a; 1996b). Structural equation modelling on the 15FQ+, in which each individual item serves as a manifest or indicator variable of the various latent personality dimensions, would however have resulted in an extremely cumbersome and extensive exercise simply due to the number of items involved. The ordinal nature of the data would also have required the calculation of the asymptotic co-variance or asymptotic variance matrices which tend to demand large amounts of memory and processing time when the number of variables are large (Jöreskog & Sörbom, 1996a; 1996b). Moreover, and in the final analysis the most critical consideration, if the individual items were used to represent the latent personality dimensions, the number of model parameters that would have to be estimated would have exceeded the number of observations in the current data set.

Consequently two manifest variables were created from each sub-scale by calculating the unweighted average of the odd numbered items and the even numbered items of each scale. Two item parcels were therefore formed for each subscale by calculating the mean score on the odd numbered items and the mean on the even numbered items of each scale. Apart from making the fitting of the model on the current data set a feasible exercise and simplifying the logistics of fitting the model, the creation of two linear composite indicator variables for each latent variable has the added advantage of creating more reliable indicator variables

[17] The results of the dimensionality and item analyses reported in paragraphs 4.3 and 4.4 would suggest that there should be some concern as to whether the premeditated operational design succeeded in providing a valid measure of the personality construct as intended. A more formal confirmation of this conclusion is, however, required.

(Nunnally, 1978). The creation of parcels was really the only feasible solution to performing a confirmatory factor analysis on the available sample of Black South African managers. Two item parcels were created from each sub-scale by calculating the unweighted average of the odd numbered items and the even numbered items of each subscale. The composite indicator variables were treated as continuous variables. The analysis of the co-variance matrix instead of the polychoric correlation matrix via maximum likelihood (or robust maximum likelihood) estimation was therefore regarded as permissible (Jöreskog & Sörbom, 1996a; 1996b; Mels, 2003).

The creation of item parcels could be seen as somewhat contentious given the results obtained on the dimensionality- and item analyses. The item parcels serve as indicator variables of the latent variables. If the objective of the analysis was to evaluate the structural relations that exist between the latent personality dimensions, then it was critical to ensure that each item parcel provides a valid measure of the latent variable it was assigned to represent. Failure to do so would prevent a valid and credible test of the hypothesized structural model (see argument presented in paragraph 1.1, p. 4 on the validity of the deductive argument in terms of which substantive hypotheses are operationalized). Under these conditions it would be imperative that the results of the dimensionality- and item analyses should be used to identify and remove inappropriate items so as to ensure that only items that validly reflect the latent variable of interest are combined in a parcel.

In the current research, however, the objective was not to test specific structural relations hypothesized to exist between specific latent variables. The objective was rather to evaluate the relationships that exist between latent variables and indicators that were designed to reflect the latent variables. The objective therefore was to evaluate the success with which items represent the latent personality dimension they were tasked to reflect. As indicated above the ideal would have been to evaluate the success with which items represent the latent personality dimension they were tasked to reflect by fitting the measurement model with the individual items as indicator variables. Since this was not feasible in this instance, all items were combined into parcels and the success with which these sets of items represented the latent personality dimension they were tasked to reflect was then evaluated. The creation of item parcels should therefore not be seen as inappropriate given the results obtained on the dimensionality- and item analyses.

Moreover, it could be argued that the formation of item parcels to some extent allowed the suppressor action to operate. The suppressor action is a core design feature of the 15FQ+. It originates from the fact that the items of the 15FQ+ reflect the whole personality. Although each item is designed to primarily reflect a specific personality dimension, they simultaneously also reflect, albeit to a lesser degree, positively and negatively, the remaining personality dimensions (Gerbing & Tuley, 1991). When fitting the measurement model with the individual items as indicators, modelling the suppressor effect presents a seemingly insurmountable problem. However, when fitting the model with the items of a subscale combined into two parcels, the same affect that is assumed to operate when calculating the subscale scores should operate when calculating the item parcels.

4.6.2 UNIVARIATE AND MULTIVARIATE NORMALITY

The default method used to estimate model parameters when fitting a measurement model to continuous data is maximum likelihood estimation. This method of estimation, however, assumes that the data follows a multivariate normal distribution. This is also true for generalized least squares (GLS) and full information maximum likelihood (FIML) as possible alternative estimation methods for structural equation modeling with continuous data (Mels, 2003). The inappropriate analysis of continuous non-normal variables in structural equation models can result in incorrect standard errors and chi-square estimates (Du Toit & Du Toit, 2001; Mels, 2003). The univariate and multivariate normality of the composite indicator variables were consequently evaluated via PRELIS (Jöreskog & Sörbom, 1996b). The null hypothesis of univariate normality had to be rejected ($p<0,05$) in the case of 13 of the 32 composite indicator variables. The results for the tests of univariate normality are shown in Table 4.35.

TABLE 4.35

TESTS OF UNIVARIATE NORMALITY FOR ITEM PARCELS

	Skewness and Kurtosis	
	Chi-Square	p-Value
FA1	16,714	0,000
FA2	22,133	0,000
FB1	14,008	0,001
FB2	22,526	0,000
FC1	0,972	0,615

FC2	2,505	0,286
FE1	0,071	0,965
FE2	17,580	0,000
FF1	3,888	0,143
FF2	2,510	0,285
FG1	24,807	0,000
FG2	17,915	0,000
FH1	2,806	0,246
FH2	4,502	0,105
FI1	0,537	0,764
FI2	0,765	0,682
FL1	1,334	0,513
FL2	11,498	0,003
FM1	0,064	0,968
FM2	0,237	0,888
FN1	6,180	0,046
FN2	17,634	0,000
FO1	7,568	0,023
FO2	1,596	0,450
FQ11	0,604	0,739
FQ12	2,521	0,284
FQ21	5,422	0,066
FQ22	9,763	0,008
FQ31	19,666	0,000
FQ32	3,336	0,189
FQ42	4,236	0,120
FQ41	4,860	0,088

The results of the test for multivariate normality are given in Table 4.36. Somewhat surprisingly, despite the fact that the null hypothesis of univariate normality had to be rejected in the case of 13 item parcels, the null hypothesis of multivariate normality nonetheless did not need to be rejected (p>0,05).

TABLE 4.36

TEST OF MULTIVARIATE NORMALITY FOR ITEM PARCELS

Skewness			Kurtosis			Skewness and Kurtosis	
Value	Z-Score	P-Value	Value	Z-Score	P-Value	Chi-Square	P-Value
153,845	1,773	0,076	1078,091	-0,117	0,907	3,159	0,206

Since the assumption of multivariate normality does hold, maximum likelihood estimation (rather than robust maximum likelihood estimation) was used to estimate the freed measurement model parameter.

4.6.3 ASSESSING OVERALL GOODNESS-OF-FIT OF THE FIRST-ORDER MEASUREMENT MODEL

Chapter 3 presented a measurement model (see Figure 3.2) informed by the architecture of 15FQ+ which portrays the manner in which the items of specific subscales (combined into linear composites) should load on their designated latent personality dimensions.

The confirmatory factor model was then applied to the co-variance matrix computed from the parcelled 15FQ+ data obtained from the 241 cases contained in the Psymetric data set. Structural equation modelling utilizing LISREL 8.54 was used to test the hypothesis that the measurement model shown in Figure 3.2 can explain the observed co-variance matrix.

More specifically the following exact fit null hypothesis was tested: that the measurement model depicted in Figure 3.2 is able to reproduce the observed co-variance matrix to a degree of accuracy that could be explained in terms of sampling error only:

H_{01}: RMSEA=0

H_{a1}: RMSEA>0

Assuming that the first-order measurement model depicted as Figure 3.2 only approximates the processes that operated in reality to create the observed co-variance matrix, the following close fit null hypothesis was also tested (Browne & Cudeck, 1993):

H_{02}: RMSEA≤0,05

H_{a2}: RMSEA>0,05

The model was fitted by analysing the co-variance matrix calculated via PRELIS from the original item parcel data set due to the fact that the null hypothesis of multivariate normality was not rejected. The item parcels were treated as continuous variables. An admissible final solution of parameter estimates for the 15FQ+ measurement model (presented in Figure 3.2) was obtained through maximum likelihood estimation after seventeen iterations.

The full spectrum of indices provided by LISREL to assess the absolute and comparative fit of the proposed measurement model is presented in Table 4.53 below. The objective of this section is to assess the goodness of fit of the measurement model. Bollen and Long (1993), Schumaker and Lomax (1996), Diamantopoulos and Siguaw (2000), Thompson and Daniel (1996) and Thompson (1997) all argue that a conclusive verdict should not be pronounced on the fit of a model based on any single indicator of fit. These scholars rather propose an integrative judgment that should consider the full spectrum of fit indices depicted in Table 4.37 below.

TABLE 4.37

GOODNESS-OF-FIT STATISTICS

Fit index	Value
Minimum Fit Function Chi-Square	425,64 (P = 0,0017)
Normal Theory Weighted Least Squares Chi-Square	410,24 (P = 0,0081)
Estimated Non-centrality Parameter (NCP)	66,24
90 Percent Confidence Interval for NCP	(19,55 ; 121,16)
Minimum Fit Function Value	1,77
Population Discrepancy Function Value (F0)	0,28
90 Percent Confidence Interval for F0	(0,081 ; 0,50)
Root Mean Square Error of Approximation (RMSEA)	0,028
90 Percent Confidence Interval for RMSEA	(0,015 ; 0,038)
P-Value for Test of Close Fit (RMSEA < 0.05)	1,00
Expected Cross-Validation Index (ECVI)	3,24
90 Percent Confidence Interval for ECVI	(3,05 ; 3,47)
ECVI for Saturated Model	4,40
ECVI for Independence Model	17,05
Chi-Square for Independence Model with 496 Degrees of Freedom	4027,04
Independence AIC	4091,04
Model AIC	778,24
Saturated AIC	1056,00
Independence CAIC	4234,56
Model CAIC	1603,44
Saturated CAIC	3423,97
Normed Fit Index (NFI)	0,89
Non-Normed Fit Index (NNFI)	0,97
Parsimony Normed Fit Index (PNFI)	0,62
Comparative Fit Index (CFI)	0,98
Incremental Fit Index (IFI)	0,98
Relative Fit Index (RFI)	0,85
Critical N (CN)	231,02
Root Mean Square Residual (RMR)	0,0094
Standardized RMR	0,051
Goodness of Fit Index (GFI)	0,90
Adjusted Goodness of Fit Index (AGFI)	0,85
Parsimony Goodness of Fit Index (PGFI)	0,59

Information on the full spectrum of fit indices should moreover be combined with information on the magnitude and distribution of the standardized residuals, the modification indices calculated for the factor loading matrix, the magnitude and significance of the lambda factor loading estimates, the magnitude and significance of the theta-delta error variance estimates and the proportion variance explained in the indicator variables by the latent variable(s) they were meant to represent. Judgment on measurement model fit should therefore integrate this basket of evidence. In support of this view, Byrne (1998) reiterates that the assessment of model adequacy must be based on multiple criteria that take into account theoretical, statistical, and practical considerations. She further points to the dangers of not doing so which could lead to one or more of the following:

- An incomplete picture of goodness of fit;
- Selection of indices based on value, not on theory;
- Difficulty for others to cross-validate the result due to some undesirable characteristics of the reported fit indices (e.g., sensitivity to sample size).

In evaluating the fit of the proposed measurement model, a basket of multiple criteria was therefore considered. A discussion of the different fit indices used in this research is given below.

4.6.3.1 Interpretation of the spectrum of model fit indices

The minimum fit function chi-square (computed as (N -1) F_{min}, where N is the sample size and *Fmin* is the value of the fitting function at convergence) value comes to 425,64 with 344 degrees of freedom (calculated as ½k(k+1)-t, where k equals the number of observed variables and t equals the number of parameters to be estimated) this yielding a highly significant result ($p < 0{,}01$), implying that the model is not adequate (Kaplan, 2000). The normal theory weighted least squares chi-square test statistic (410,24) projects the same picture.

This thus leads to the rejection of the null hypothesis of the exact model fit (H_0: $\Sigma = \Sigma(\theta)$). This rejection implies that the first-order measurement model does not have the ability to reproduce the observed co-variance matrix to a degree of accuracy explainable in terms of sampling error only. However, Kaplan (2000, p. 84) mentions that “the chi-square statistic is sensitive to departures from multivariate normality (particularly excessive kurtosis), sample size and also assumes that the model fits perfectly in the population”. Hence, he suggests that “instead of regarding χ^2 as a test statistic, one should regard it as a goodness (or badness) of fit measure in the sense that large χ^2-values correspond to bad fit and small values to good fit”. In support of the latter view, Spangenberg and Theron (2005) comment that the null hypothesis of exact model fit is rather unrealistic. They cite Brown and Cudeck (1993, p. 137) who argue that:

> In applications of the analysis of co-variance structures in the social sciences it is implausible that any model that we use is anything more than an approximation to reality. Since a null hypothesis that a model fits exactly in some population is known a priori to be false, it seems pointless even to try to test whether it is true.

Diamantopoulos and Siguaw (2000) suggest that instead of testing whether the model is correct, or fits the population co-variance matrix exactly, one should possibly assess the degree of lack of fit of the model which in this case was done through the estimated non-centrality parameter. Theron and Spangenberg (2005) argue that treating the chi-square statistic as a descriptive badness-of-fit measure by expressing the minimum fit function chi-square estimate in terms of the degrees of freedom ($\chi^2/df = 1{,}24$), suggests that the measurement model demonstrates acceptable fit to the data. Kelloway (1996), however, cautions that the guidelines indicative of good fit (ratios between 2 and 5) have little justification other than the researcher's personal modelling experience and advises against strong reliance on the normed chi-square.

Diamantopoulos and Siguaw (2000) argue that if it were *a priori* assumed that the first- order measurement model only approximates the processes that operated in reality to create the observed co-variance matrix, the χ^2 test statistic would follow a non-central χ^2 distribution with a non-centrality parameter, λ. The estimated λ value (66,24) reflects the estimated discrepancy between the observed (Σ) and the estimated population co-variance ($\Sigma^{\wedge}$) matrices.

The first order measurement model was fitted by minimizing a fit function that compares the observed sample co-variance matrix (S) to the reproduced sample co-variance matrix ($S^{\wedge}$) derived from the model parameter estimates (Jöreskog & Sörbom, 1993; Spangenberg & Theron, 2005). In this case, an indication of the model fit achieved was depicted by the extent to which the minimum fit function value (1,77) approaches zero. The estimated population discrepancy function value *(F_0)* reflects the extent to which the observed population co-variance matrix (Σ) is estimated to differ from the reproduced population co-variance ($\Sigma^{\wedge}$) resulting from the parameters minimizing the selected discrepancy function fitting the model on Σ (Brown & Cudeck, 1993). In this case a point estimate of 0,28 was obtained for F_0 with confidence interval limits of 0,081 and 0,50. Spangenberg and Theron (2005) argue that a perfect or exact model fit would have been achieved if F_0 had been zero because the observed population co-variance matrix Σ would then have been equal to the estimated population co-variance matrix ($\Sigma^{\wedge}$).

The root mean square error of approximation (RMSEA) indexes the discrepancy between the observed population co-variance matrix and the estimated population co-variance matrix implied by the model per degree of freedom. Values below 0,05 are generally regarded as indicative of good model fit, values above 0,05 but less than 0,08 as indicative of reasonable fit; values greater than or equal to 0,08 but less than 0,1 indicative of mediocre fit and values exceeding 0,10 indicate are generally regarded as indicative of poor fit (Brown & Cudeck, 1993; Diamantopoulos & Siguaw, 2000). Diamantopoulos and Siguaw (2000) regard RMSEA as one of the most informative fit indices and indicate that it is calculated as follows: $(F0/df)^{1/2}$, where F_0 is the population discrepancy function value and *df* represents the degrees of freedom. As such, a value of zero would be deemed as an indication of the absence of any discrepancy, and would therefore depict a perfect fit of the model to the data (Mulaik & Millsap, 2000). When evaluated against the interpretation convention outlined above, the RMSEA value of 0,028 indicates that the measurement model shows a very good fit (Diamantopoulos & Siguaw, 2000). The 90 percent confidence interval for RMSEA shown in Table 4.37 (0,015 – 0,038) indicates that the fit of the structural model could be regarded as good. The fact that the upper bound of the confidence interval falls below the critical cut off value of 0,05 moreover indicates that the null hypothesis of close fit would not be rejected. A formal test of close fit (in contrast to exact fit) is performed by LISREL by testing H_{02}: RMSEA ≤ 0,05 against H_{a2}: RMSEA > 0,05. Table 4.37 indicates that the obtained RMSEA value of 0,028 is significantly lower than the target value of 0,05 (implying that H_{02} is not rejected: $p > 0,05$).

While both the non-centrality parameter (NCP) and the RMSEA focus on error due to approximation (i.e., the discrepancy between Σ and Σ(θ)), Byrne (1998) and Spangenberg and Theron (2005) describe the expected cross-validation index (ECVI) as focusing on overall error (i.e., the difference between the reproduced sample co-variance matrix (Sˆ) derived from fitting the model on the sample at hand and the expected co-variance matrix that would be obtained in an independent sample of the same size from the same population). This means that it therefore focuses on the difference between Sˆ and Σ). Given its (ECVI) purpose, Diamantopoulos and Siguaw (2000) indicate that it is a useful indicator of a model's overall fit. The model ECVI (3,24) is smaller than the value for the independence or null model (17,05) and the ECVI value associated with the saturated model (4,40). This finding comments positively on the measurement model fit as it suggests that the fitted model seems to have a better chance of being replicated in a cross-validation sample than the (more complex) saturated model or the (less complex) independence model. This argument is based on Kelloway's (1998) suggestion that smaller values on this index indicate a more parsimonious fit.

In assessing the parsimonious fit Spangenberg and Theron (2005) suggest that the model fit could always be improved by adding more paths to the model and estimating more parameters until a perfect fit is achieved in the form of a saturated or just-identified model with no degrees of freedom. This view is also shared by Davidson (2000) who argues that, as a general rule, increasing the parameters in a model will serve to increase its fit to the observed data. However, these scholars are also not oblivious oto the fact that the objective of model building is to achieve satisfactory fit with as few model parameters as possible. Spangenberg and Theron (2005) consequently comment that the objective in this regard would be to find the most parsimonious model.

A number of parsimony fit indices exist. The parsimonious normed fit index (PNFI = 0,62) and the parsimonious goodness of fit index (PGFI = 0,59) depicted in Table 4.53 approaches model fit from this perspective. Davidson (2000) describes the PGFI as a modified goodness-of-fit index (GFI; see subsequent discussion below) to take into account parsimony of the model. The PGFI is calculated as [*1- (number of estimated parameters/number of data-points)]*GFI*. The closer this fit index is to a value of 1,00 the better the fit of the model (Davidson, 2000). The values obtained on the PNFI and the PGFI therefore suggest a somewhat less satisfactory model fit. Spangenberg and Theron (2005) are, however, of the view that the meaningful use of the above cited indices necessitates a second explicitly formulated and fitted model with additional paths that can be theoretically justified so that the initial model is nested within the more elaborate model. In this case, no such alternative model exists.

An assessment of the values of the Aiken information criterion (AIC = 778,24) presented in Table 4.53 suggests that the fitted measurement model provides a more parsimonious fit than both the independent/null model (4091,04) and the saturated model (1056,00) since smaller values on these indices indicate a more parsimonious model (Kelloway, 1998; Spangenberg & Theron, 2005). The values for consistent Aiken information criterion (CAIC = 1603,44), likewise suggest that the fitted measurement model provides a more parsimonious fit than both the independent/null model (4243,56) and the saturated model (3423,97). For these two indices, small values suggest a parsimonious fit although there is no consensus regarding precisely how small values should be. This suggests, in conjunction with the ECVI results, that the fitted model does not provide a too simplistic account of the process underlying the 15FQ+ in the sense that it fails to model one or more influential paths.

The indices of comparative fit reported by LISREL as shown in Table 4.53 suggest good model fit relative to that of the independence model. The normed fit index (NFI = 0,89), the non-normed fit index (NNFI = 0,97), the comparative fit index (CFI = 0,98), the incremental fit index (IFI = 0,98), can all assume values between 0 and 1 with 0,90, generally considered indicative of a well-fitting model (Bentler, 1990; Bentler & Bonnett, 1980; Kelloway, 1998; Spangenberg & Theron, 2005). Three of the four above mentioned indices exceed the critical value of 0,90 thus indicating good comparative fit relative to the independence model. Diamantopoulos and Siguaw (2000) recommend that specifically the NNFI and CFI indices ought to be relied upon for fit assessment. If stronger emphasis were placed on these two indices, it would suggest that the model fits the data quite well.

The critical sample size statistic (CN) reflects the size of the sample that would have made the obtained minimum fit function χ^2 statistic just significant at the 0,05 significance level. The estimated CN value (231,02) falls slightly above the recommended threshold value of 200 suggested by Diamantopoulos and Siguaw (2000) which is regarded as indicative of the model providing adequate representation of the data. However, Spangenberg and Theron, (2005) cite Hu and Bentler (1995) who caution that this proposed threshold should be used with circumspection.

The root mean square residual **(**RMR = 0,0094), which represents the average value of the residual matrix (S-Sˆ), and the standardized RMR, which represents the fitted residual divided by their estimated standard errors, (0,051) indicate reasonable to good fit. Diamantopoulos and Siguaw (2000) indicate that values less than 0,05 on the latter index are regarded as indicative of a model that fits the data well. Diamantopoulos and Siguaw (2000) however caution that problems could be encountered in interpreting the fitted residual (and, therefore, the RMR statistic) in that their magnitude varies with the unit of measurement and the latter can vary from variable to variable. Hence, these scholars suggest that this problem could be avoided by concentrating on the standardized residuals. Each standardized residual could then be interpreted as standard normal deviate and considered “large” if it is greater than 2,58 in absolute value.

The goodness-of-fit index (GFI) provides an indication of the relative amount of variances and co-variances jointly explained by the model (Diamantopoulos & Siguaw, 2000). The adjusted goodness-of-fit index (AGFI) and the parsimony goodness-of-fit index (PGFI) reflect the success with which the reproduced sample co-variance matrix recovered the observed sample co-variance matrix (Diamantopoulos & Siguaw, 2000). The AGFI adjusts the GFI for the degrees of freedom in the model while the PGFI makes an adjustment based on model complexity (Diamantopoulos & Siguaw, 2000; Jöreskog & Sörbom, 1993; Kelloway, 1998). The two measures should be between zero and unity with values exceeding 0,90 usually interpreted as indicating good fit to the data. Evaluating the fit of the model using these two indices (0,85 and 0,90) portrays a relatively favourable conclusion on model fit. However, Spangenberg and Theron (2005) reiterate Kelloway’s (1998) view that these guidelines for the interpretation of GFI and AGFI are based on experience, are somewhat arbitrary and should therefore be used with circumspection. These scholars further cite Diamantopoulos and Siguaw (2000) who argue that acceptable values for the PGFI generally tend to be somewhat more conservative even when other indices indicate acceptable fit. Hence, Diamantopoulos and Siguaw (2000) suggest that out of the three indices discussed above, the GFI is generally recommended as the most reliable measure of absolute fit in most circumstances.

The conclusion that could be drawn from the integrated results obtained from the full spectrum of fit statistics seems to suggest a good to reasonable fitting model that clearly outperforms the independence model. The results moreover seem to suggest that the fitted model does not provide a too simplistic account of the process underlying the 15FQ+ in the sense that it fails to model one or more influential paths.

4.6.3.2 Examination of residuals

An examination of the stem-and–leaf plot shows the shape and distribution of the standardized residuals (presented in Figure 4.1) to be slightly negatively skewed. Large standardized residuals would be indicative of co-variance (or the lack thereof) between indicator variables that the model fails to explain. Standardized residuals can be interpreted as standard normal deviates. On a 1% significance level standardized residuals with absolute values greater than 2,58 could thus be considered large (Diamantopoulos & Siguaw, 2000). A large positive residual would indicate that the model underestimates the co-variance between the two observed variables. Adding paths to the model that could account for the co-variance should, therefore, rectify the problem. Conversely, a large negative residual would indicate that the model overestimates the co-variance between two specific observed variables. The remedy, in turn, would lie in the pruning away of paths that are associated with the indicator variables in question (Diamantapoulos & Siguaw, 2000; Kelloway, 1998).

```
Stemleaf Plot

 - 3|988
 - 3|4
 - 2|77665555
 - 2|43322222111110000000
 - 1|9998888777766665555555
 - 1|444444443333333222222221111111111111111111110000000000000
 - 0|999999999999998888888888888888777777777777666666666665555555555555555
 - 0|444444444444443333333333333222222222222222222111111111111000000000000000+50
   0|11111111111111112222223333333333344444444444
   0|55555555555555666666666666777777777777777788888888888888899999999999
   1|000000111111111111222222222233333333333333444444
   1|55555555666666777777777788888888999999
   2|0000111222444
   2|55667788899
   3|002
```

Figure 4.1 Stem - and - leaf plot of the standardized residuals

Figure 4.1 shows that both the smallest standardized residual (-3,89) and the largest (3,24) standardized residual fall beyond the 0,01 significance limits. The fact that the fitted measurement model resulted in eight large negative residuals and twelve large positive residuals is a cause for concern. The existence of the twelve large positive and eight large negative residuals indicates that twenty out of 496 observed co-variance terms in the observed sample co-variance matrix (S) (4%) are poorly estimated by the derived model parameter estimates. The small percentage large residuals would again suggest reasonable to good model fit. Good model fit would have been indicated if no large standardized residuals were found.

Moderately problematic model fit is further indicated by the rather slight deviation from the 45˚-reference line in the Q-plot shown in Figure 4.2 both in the upper and lower regions of the X-axis.

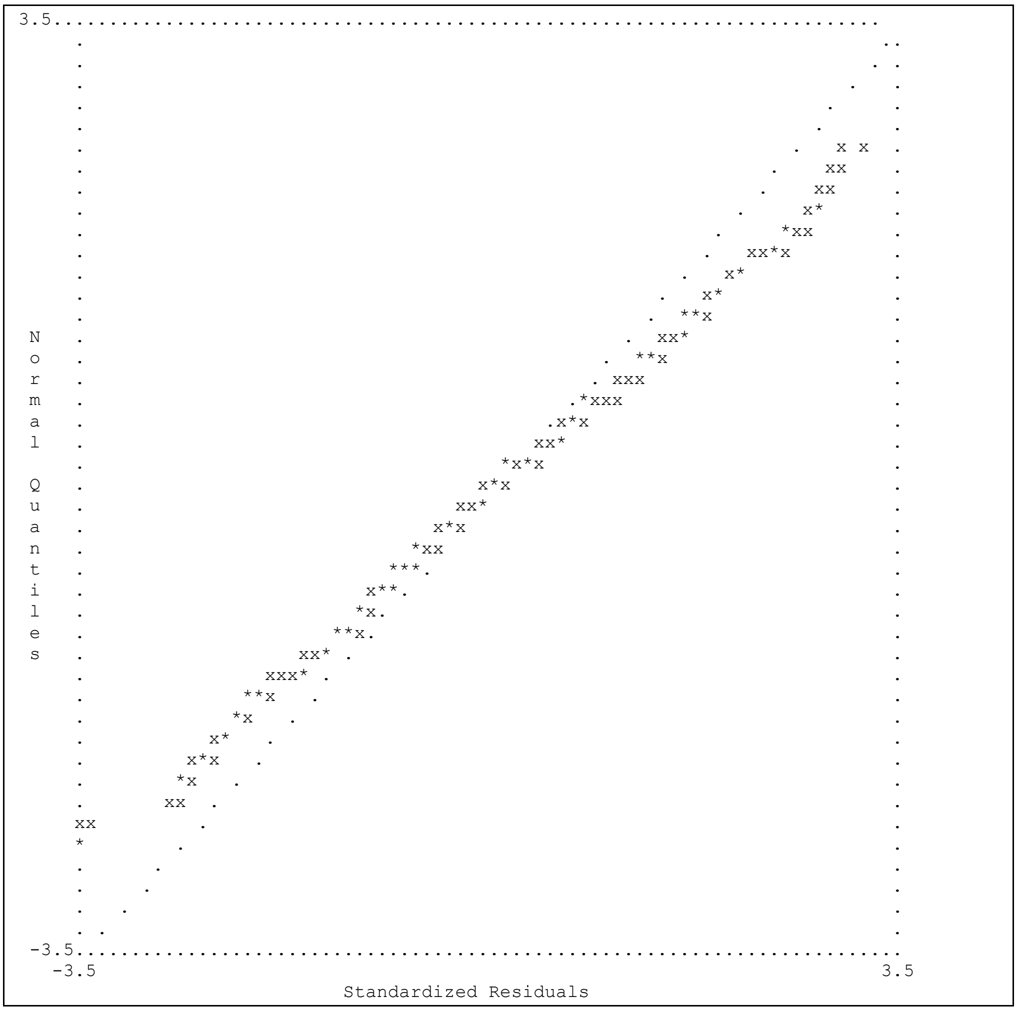

Figure 4.2 Q - plot of standardized residuals

4.6.3.3 Model modification indices

The fit of the proposed model depicted in Figure 3.2 does not seem to be without problems. This r supports Brekler's (1990) comment that *a priori* theoretical models frequently do not provide an adequate fit to the data. Hence, he suggests that when this happens, the original model could be modified to improve its fit through any of the following options:

- Changing factor loadings (λ) from fixed to free or vice versa,
- Allowing for or constraining correlations among measurement errors (δ), and

- Allowing for or constraining correlations among the exogenous latent variables (ξ).

However, in spite of the suggested measures that could be used to improve on the model fit, Breckler (1990) caution that there is no guarantee that the process will lead to the population model and that it is not clear as to which paths when added to the model would significantly improve the parsimonious fit of the model. Hence, Breckler (1990) and Cudeck and Browne (1983) suggest that when model modification is explored, the results should be interpreted with circumspection and that the model should be subjected to cross-validation whenever possible. In the case of this study, however, inspection of the modification indices was not motivated by the desire to improve the fit of the measurement model but rather to further evaluate the fit of the model. If the fit of the current model with the constraints it imposes by fixing specific model parameters to zero cannot be improved by freeing the currently fixed parameters, it reflects positively on the merits of the model. If, on the other hand, there are numerous additional currently fixed model parameters that if freed, would significantly improve the fit of the model, it erodes the credibility of the current model. The other constraining factor, as discussed elsewhere, is that the researcher did not have the right or privilege to alter the manner in which the instrument is constructed or used.

The modification indices calculated by LISREL estimate the decrease that should be found in the χ^2 statistic if currently fixed parameters were set free and the model were re-estimated. Large modification index values (that is chi-square values exceeding 6,6349) would therefore indicate parameters that, if set free, would improve the fit of the model significantly ($p < 0{,}01$). Examination of the modification indices calculated for the factor loading matrix (Λ_X) indicates twenty four additional paths that would significantly improve the fit of the 15FQ+ measurement model. Therefore only 24 out of 480 (932 x 16 elements in Λ_X minus 32 freed factor loadings) factor loadings currently fixed to zero (5%) would, if freed, result in a significant ($p<0{,}01$) improvement in model fit. It is worth noting that all the significant modification index values calculated for the factor loading matrix involve the item parcels containing items from the Openness to Change (Q1), Self-reliance (Q2) and Perfectionism (Q3) subscales. The modification indices suggest more specifically that the two Q3 item parcels could also serve as indicators of factors B, C, E, H, L, M and O. The two Q2 item parcels also reflect factors F and N. The two Q1 item parcels also reflect factors H, L and Q2. The small percentage of significant ($p < 0{,}01$) modification index values in the factor loading matrix comments favourably on the fit of the 15FQ+ measurement model.

Examination of the modification indices calculated for the variance-co-variance matrix (Θ_δ) indicates 6 co-variance paths (of the (32 x 31)/2 = 496 co-variance terms currently fixed to zero) that would significantly improve the fit of the 15FQ+ measurement model if the current assumption of uncorrelated measurement error terms were to be relaxed. The small percentage (1,2%) of significant ($p < 0{,}01$) modification index values in the variance-co-variance matrix (Θ_δ) comments favourably on the fit of the 15FQ+ measurement model.

The findings regarding the addition of one or more paths moreover essentially corroborates the inferences derived from the values of the expected cross-validation index (ECVI), the consistent Aiken information criterion (CAIC) and the Aiken information criteria (AIC) discussed above.

The small percentage of significant ($p < 0{,}01$) modification index values in the factor loading matrix specifically, and to a somewhat lesser extent the small percentage of significant ($p < 0{,}01$) modification index values in the variance-co-variance matrix (Θ_δ) provides some support for the argument that the formation of item parcels to some extent allows the suppressor action to operate.

4.6.4 EVALUATION OF THE FIRST-ORDER FACTOR MODEL

The completely standardized factor loading matrix (Λ_X) depicted in Table 4.38 below reflecting the regression of the item parcels X_j on the latent personality dimensions ξ_i was used to evaluate the significance and the magnitude of the first-order factor loadings hypothesized by the proposed measurement model represented by Equation 1. An evaluation of the results shown in Table 4.38 indicates that all the freed first-order factor loadings are significant ($p < 0{,}05$). All 32 null hypotheses H_{0i}: $\lambda_{jk}=0$; i=3, 4, …, 34; j=1, 2, …, 32; k=1, 2, …, 16 can therefore be rejected in favour of H_{ai}: $\lambda_{jk}\neq 0$; i=3, 4, …, 34; j=1, 2, …, 32; k=1, 2, …, 16. The fit of the model would therefore deteriorate significantly if any of the existing paths in the measurement model would be pruned away by fixing the corresponding parameters in Λ_X to zero and thus effectively eliminating the subset of items in question from the sub-scale in which they are currently included. None of the existing paths in the model are therefore redundant. All item parcels significantly reflect the latent personality dimension they were designed to measure.

TABLE 4.38

COMPLETELY STANDARDIZED FACTOR LOADING MATRIX

	FA	FB	FC	FE	FF	FG	FH	FI	FL	FM	FN	FO	FQ1	FHQ2	FIQ3	FIQ4
FA1	,058															
FA2	0,63															
FB1	--	,64														
FB2	--	,054														
FC1	--	--	0,79													
FC2	--	--	0,75													
FE1	--	--	--	0,72												
FE2	--	--	--	0,60												
FF1	--	--	--	--	0,72											
FF2	--	--	--	--	0,82											
FG1	--	--	--	--	--	0,80										
FG2	--	--	--	--	--	0,65										
FH1	--	--	--	--	--	--	0,77									
FH2	--	--	--	--	--	--	0,80									
FI1	--	--	--	--	--	--	--	0,77								
FI2	--	--	--	--	--	--	--	0,68								
FL1	--	--	--	--	--	--	--	--	0,77							
FL2	--	--	--	--	--	--	--	--	0,79							
FM1	--	--	--	--	--	--	--	--	--	0,76						
FM2	--	--	--	--	--	--	--	--	--	0,53						
FN1	--	--	--	--	--	--	--	--	--	--	0,71					
FN2	--	--	--	--	--	--	--	--	--	--	0,72					
FO1	--	--	--	--	--	--	--	--	--	--	--	0,72				
FO2	--	--	--	--	--	--	--	--	--	--	--	0,53				
FQ11	--	--	--	--	--	--	--	--	--	--	--	--	0,61			
FQ12	--	--	--	--	--	--	--	--	--	--	--	--	0,70			
FQ21	--	--	--	--	--	--	--	--	--	--	--	--	--	0,62		
FQ22	--	--	--	--	--	--	--	--	--	--	--	--	--	0,68		
FQ31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0,57	
FQ32	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0,64	
FQ42	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0,63
FQ41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0,70

Despite the fact that item parcels significantly reflect the latent personality dimension they were designed to represent, the factor loading matrix is not without problems as most of the loadings are quite low indicating that the item parcels generally do not represent the latent personality dimensions they were designed to reflect very well. This in turn would suggest that the items comprising each item parcel generally do not represent the latent personality dimensions they were designed to reflect very well. The latter inference agrees with the conclusion derived from the dimensionality and item analyses reported earlier. Spangenberg and Theron (2005) describe the completely standardized λ parameter estimates as reflecting the average change in standard deviation units in a manifest variable X, directly resulting from a one standard deviation change in a first-order exogenous latent variable ξ to which it has been linked, holding the effect of all other variables constant. Judging from the results presented in Table 4.38, it could be concluded that all indicator variables generally load poorly to moderately on the first-order factors to which they have been assigned. The sensitivity with which the indicator variables respond to changes in the latent variables they represent is therefore reasonably poor. Relatively small changes in the latent variables will not be discernable in a corresponding change in the indicator variable. The rate at which the indicator variable value changes as the latent variable it represents changes, is relatively small. A finding of somewhat lower factor loadings is, on the other hand, to be expected given the broad nature of the personality dimensions and the fact that the responses to items are determined by the whole personality.

The finding that the indicator variables generally do not succeed in reflecting the latent variables they were designed to represent very well is corroborated by the squared multiple correlations for the observed indicator variables values reported in Table 4.39. Table 4.39 reports the proportion of item parcel variance that is explained by the latent variable it has been designed to reflect in terms of the measurement model.

Table 4.39 reveals that at best only a modest proportion of item parcel variance is explained by the latent personality dimension it has been designed to reflect in terms of the measurement model (i.e., Equation 1).

TABLE 4.39

SQUARED MULTIPLE CORRELATIONS FOR ITEM PARCELS

FA1	FA2	FB1	FB2	FC1	FC2	FE1	FE2	FF1	FF2	FG1	FG2	FH1	FH2	FI1	FI2
0.33	0.40	0.41	0.30	0.62	0.56	0.52	0.36	0.52	0.66	0.64	0.43	0.59	0.64	0.59	0.46
FL1	FL2	FM1	FM2	FN1	FN2	FO1	FO2	FQ11	FQ12	FQ21	FQ22	FQ31	FQ32	FQ42	FQ41
0.59	0.62	0.58	0.28	0.50	0.51	0.51	0.28	0.37	0.48	0.39	0.47	0.33	0.42	0.40	0.49

To explain the total variance in the i^{th} item parcel (X_i) Spangenberg and Theron (2005) indicate that it could be decomposed into variance due to:

- Variance in the latent variable the item set was meant to reflect (ξ_i),
- Variance due to variance in the other systematic latent effects the item parcel was not designed to reflect, and
- Variance due to random measurement error.

The latter two sources of variance in the item parcels (i.e., b & c) are acknowledged in Equation 1 through the measurement term (δ_i). The measurement error variances for the item parcels are shown in Table 4.40.

TABLE 4.40

COMPLETELY STANDARDIZED MEASUREMENT ERROR VARIANCES

FA1	FA2	FB1	FB2	FC1	FC2	FE1	FE2	FF1	FF2	FG1	FG2	FH1	FH2	FI1	FI2
0,67	0,60	0,59	0,70	0,38	0,44	0,48	0,64	0,48	0,34	0,36	0,57	0,41	0,36	0,41	0,54
FL1	FL2	FM1	FM2	FN1	FN2	FO1	FO2	FQ11	FQ12	FQ21	FQ22	FQ31	FQ32	FQ42	FQ41
0,41	0,38	0,42	0,72	0,50	0,49	0,49	0,72	0,63	0,52	0,61	0,53	0,67	0,58	0,60	0,51

The measurement error term δ thus does not differentiate between systematic and random sources of error or non-relevant variance. The values in Table 4.40 reiterate the conclusion derived from Table 4.38 and Table 5.39. The items of the 15FQ+ are relatively noisy measures of the latent personality dimensions they were designed to reflect. This inference also dovetails with the conclusions derived from the item and dimensionality analyses performed on each subscale. Combining the results available on the items of the subscales of the 15FQ+ indicate that they generally provides relatively contaminated reflection of their designated latent personality dimensions.

Spangenberg and Theron (2005) argue that a specific mathematical relationship exists between the results reported in Tables 4.38, 4.39 and 4.40. When regressing a dependent variable (an item parcel in this case) onto a single independent variable (the latent variable in this case) the slope of the regression would be given by the correlation between the dependent and independent variable multiplied by the ratio of the dependent variable standard deviation to the independent variable standard deviation (i.e., $r_{XY}(S_Y/S_X)$). If the dependent and independent variables were assumed to be standardized variables as is the case in the completely standardized solution the slope simplifies to the correlation between the dependent and independent variable since the standard deviations of standardized variables are unity. The values presented in Table 4.38 could therefore be interpreted as item parcel validity coefficients. The square of the completely standardized factor loadings λ (see Table 4.38 above) could moreover be interpreted as the proportion of systematic-relevant item parcel variance (Spangenberg & Theron, 2005).The diagonal of the completely standardized theta-delta (θ_δ) matrix shown in Table 4.40 reflects the proportion of non-relevant item parcel variance. Spangenberg and Theron (2005) argue that the completely standardized error variance of the ith item parcel ($\theta_{\delta ii}$) can be decomposed into systematic non-relevant variance and random error variance. Spangenberg and Theron (2005) therefore conclude that, since (λ^2_{ij} + $\theta_{\delta ii}$) are equal to unity in the completely standardized solution, the validity coefficients can be defined as follows:

$$
\begin{aligned}
\rho(Xi,\xi j) &= \sigma^2_{\text{systematic-relevant}}/(\sigma^2_{\text{systematic-relevant}} + \sigma^2_{\text{non-relevant}}) \\
&= \lambda^2_{ij}/[\lambda^2_{ij} + \theta_{\delta ii}] \\
&= 1- (\theta_{\delta ij}/[\lambda^2_{ij} + \theta_{\delta ii}]) \\
&= 1- \theta_{\delta ii} \\
&= \lambda^2_{ij}
\end{aligned}
$$

Spangeberg and Theron (2005) moreover argue that since reliability could be defined as the extent to which the variance in item parcels can be attributed to systematic sources, irrespective of whether the source of variance is relevant to the measurement intention or not, the values presented in Table 4.38 could, when squared, simultaneously be interpreted as lower bound estimates of the item reliabilities ρ_{ii}. These scholars further argue that the extent to which the true item reliabilities would be under-estimated would be determined by the extent to which δ_{ii} contains the effect of the systematic non-relevant latent influences.

The phi-matrix of correlation between the 16 latent personality dimensions is depicted in Table 4.41.

TABLE 4.41

PHI MATRIX

	FA	FB	FC	FE	FF	FG	FH	FI	FL	FM	FN	FO	FQ1	FQ2	FQ3	FQ4
FA	1,00															
FB	0,37*	1,00														
FC	0,20*	0,61*	1,00													
FE	0,06	0,55*	0,25*	1,00												
FF	0,31*	0,37*	0,21*	0,41*	1,00											
FG	0,39*	0,15	0,10	0,10	-0,08	1,00										
FH	0,32*	0,59*	0,55*	0,73*	0,74*	0,09	1,00									
FI	0,55*	0,10	0,11	-0,12	-0,05	0,13	0,05	1,00								
FL	-0,16	-0,37*	-0,49*	-0,29*	-0,08	0,07	-0,32*	0,01	1,00							
FM	0,15	0,37*	-0,06	0,22*	0,14	-0,26*	0,08	0,31*	-0,18	1,00						
FN	0,36*	-0,05	0,17	-0,31*	-0,28*	0,46*	-0,06	0,19*	0,05	-0,36*	1,00					
FO	0,18	-0,50*	-0,70*	-0,57*	-0,30*	0,20*	-0,62*	0,17	0,35*	-0,09	0,23*	1,00				
FQ1	-0,02	0,22*	-0,01	0,25*	0,24*	-0,44*	0,26	0,12	-0,14	0,58*	-0,57*	-0,26*	1,00			
FQ2	-0,19	-0,20	-0,19*	-0,31*	-0,54	-0,03	-0,49*	0,15	0,34*	0,13	-0,07	0,21*	-0,01	1,00		
FQ3	0,22	-0,07	-0,05	-0,07	-0,23*	0,62*	-0,18	0,05	0,24*	-0,38*	0,68*	0,38*	-0,72*	-0,09	1,00	
FQ4	-0,29*	-0,33*	-0,70*	0,10	-0,02	-0,35*	-0,29*	-0,06	0,29*	0,25*	-0,52*	0,45*	0,23*	0,18	-0,17	1,00

The off-diagonal elements of the Φ-matrix are the inter-personality dimension correlations disattenuated for random measurement error. Not all correlations are significant ($p < 0,05$). In magnitude the correlations between the latent personality dimensions vary from low to moderate which should be considered a positive result since it supports the convergent validity of the 16 first-order personality dimensions assumed by the 15FQ+.

4.6.5 POWER ASSESSMENT

The close fit null hypothesis was not rejected. The observed population co-variance matrix (Σ) could therefore be assumed to closely approximate the reproduced population co-variance ($\Sigma^{\wedge}$) matrix derived from the model parameters. The concern that arises is whether this result is due to a lack of statistical power or whether it accurately reflects the true state of affairs. This concern increases as sample size decreases. If the decision not to reject the null hypothesis of close fit results under conditions of low power, it causes ambiguity because it is not clear whether the decision was due to the accuracy of the model or to the insensitivity of the test to detect specification errors in the model. Statistical power refers to the conditional probability of rejecting the null hypothesis given that it is false (P[reject H_0: RMSEA≤0,05)|H_0 false]). In the context of SEM the close fit null hypothesis essentially states that the proposed model closely approximates the process that operates in reality. In the context of SEM, statistical power therefore refers to the probability of rejecting an incorrect model. The decision not to reject H_{02}: RMSEA≤0,05 would constitute convincing evidence of the merit of the model, to the extent that the statistical power of the evaluation of close fit would be found to have reasonably high power.

When the chi-square test is applied only Type I errors are explicitly taken into account, thus, a power analysis must be undertaken to also account for the probability of Type II errors (Diamantopoulos & Siguaw, 2000). Diamantopoulos and Siguaw (2000) explain the difference between Type I and Type II error in the context of structural equation modelling as follows:

> When we test a model's fit by, say, the chi-square test, we emphasize the probability of making a **Type I error**, i.e. rejecting a correct model; this probability is captured by the **significance level**, α which is usually set at 0,05. A significant chi-square result indicates that *if* the null hypothesis is true (i.e. the model is correct in the population), then the probability of incorrectly rejecting it is low (i.e. less than five times out of 100 if α= 0,05). However, another error that can occur is *not* to reject an incorrect model. This type of error is known as **Type II error** and the probability associated with it is denoted as β. The probability of avoiding a Type II error is, therefore, 1-β and it is this probability that indicates the power of our test; thus the

> power of the test tells us how likely it is that a false null hypothesis (i.e. incorrect model) will be rejected. (p. 93)

The power associated with the test of close fit was therefore estimated. The close fit null hypothesis states that the model has a close but imperfect fit in the population. The test of close fit tests a hypothesis on the value of the RMSEA statistic. If a model has a close but imperfect fit in the population the error due to approximation is set at 0,05 and the null hypothesis formulated earlier as H_{02a} is consequently tested against H_{a2a} (Diamantopoulos & Siguaw, 2000). To determine the power of a test of the close fit hypothesis, a specific value for the parameter needs to be assumed under H_{a2} because there are as many power estimates as there are possible values for the parameter under H_{a2}. A value that makes good sense to use in this instance is RMSEA = 0,08, since RMSEA = 0,08 is the upper limit of reasonable fit. In this specific analysis two additional possible values for RMSEA under H_{a2} were also considered, namely 0,70 and 0,60.

With the information on H_{02} and H_{a2} and given a significance level (α) of 0,05 and a sample size N, the power of the test becomes a function of the degrees of freedom (ν) in the model (ν=½[(p][p+1]-t)=528-184=344[18]). All other things being equal, the higher the degrees of freedom, the greater the power of the test (Diamantopoulos & Siguaw, 2000). Power tables compiled by MacCallum, Browne, and Sugawara (1996) only make provision for degrees of freedom ≤ 100 and N ≤ 500. A SPSS translation of the SAS syntax provided by MacCallum *et al.* (1996) was consequently used to derive power estimates for the tests of close fit, given the effect size assumed above, a significance level (α) of 0,05 and a sample size of 241. The degrees of freedom (ν) in the model is ν=½[(p][p+1]-t)=528-184=344. The results of the power analysis are reported in Table 4.42.

Table 4.58 indicates that the probability of rejecting the null hypothesis of close fit under the true condition of mediocre fit (i.e., RMSEA=0,80) is unity. If the model fit in the population were mediocre, H_{02} would have been rejected. H_{02}, however, was not rejected. True model fit therefore must be better than mediocre.

[18] t represents the number of parameters to be estimated in the fitted model and p the number of indicator variables.

TABLE 4.42

ANALYSIS OF THE POWER ASSOCIATED WITH THE TEST OF THE NULL HYPOTHESIS OF CLOSE FIT UNDER THREE DIFFERENT H_{a2} SCENARIOS

RMSEA value under H_{a2}	alpha	RMSEA value under H_{02}	N	ncp0	ncpa	cval	power	df	n_alpha
0,80	,05000	,05000	241,00	206,40000	528,38400	615,80855	1,000000	344,00	,05000
0,70	,05000	,05000	241,00	206,40000	404,54400	615,80855	,998157	344,00	,05000
0,60	,05000	,05000	241,00	206,40000	297,21600	615,80855	,716736	344,00	,05000

Table 4.42 indicates that the probability of rejecting the null hypothesis of close fit if the value of RMSEA under $H_{a2,}$ is 0,70 is 0,998157. If it were assumed that the true model fit in the population was RMSEA=0,60 the power of the test of close fit would be 0,716736. These power estimates, taken in conjunction with the decision not to reject the null hypotheses of close fit, suggest that the conclusion of close model fit should be seen as highly credible in that the test was highly sensitive to misspecifications in the model.

4.6.6 SUMMARY

Previous research (Psytech SA, 2003; Tyler, 2002, 2004) has explored the psychometric properties of the 15FQ+ in various settings within and outside South Africa on inclusive groups. To-date no known study has been done on an exclusively Black South African sample. The instrument is despite this nonetheless regularly used to assess personality amongst Black South Africans. There consequently exists a need to investigate the validity of this instrument as a measure of personality within this group in the South African setting.

The substantive hypothesis tested in this study is that the 15FQ+ provides a valid and reliable measure of personality as it is defined by the instrument amongst Black South African managers.

In operational terms the hypothesis is that the measurement model implied by the scoring key of the 15FQ+ can closely reproduce the co-variances observed between the item parcels formed from the items comprising each of the sub-scales, that the factor loadings of the item parcels on their designated latent personality dimensions are significant and large, that the measurement error variances associated with each parcel are small, that the latent personality dimensions explain large proportions of the variance in the item parcels that represent them and that the latent personality dimensions correlate low-moderately with each other.

In assessing the model fit, it became evident that one would need to use a variety of fit indices that assess fit in different ways. Multiple criteria of model fit should be considered as Diamantopoulos and Siguaw (2000, p. 88) argue that "no one index serves as a definite criterion for testing a hypothesized model". The results obtained show that the model's overall fit is acceptable. The null hypothesis of close fit is not rejected, the basket of fit indices reported by LISREL indicate close–reasonable fit, a small percentage of the standardized co-variance residuals are large and a small percentage of the modification indices calculated for the Λ_X and Θ_δ matrices are large.

The measurement of personality is nonetheless not without problems. The factor loadings, although significant, tend to be rather moderate, the measurement error variances uncomfortably large and the proportion variance explained in the linear item composites disappointingly low. The 15FQ+ therefore seems to provide a noisy measure of personality amongst Black South African managers with moderate reliability and validity.

CHAPTER 5
CONCLUSIONS AND RECOMMENDATIONS FOR FUTURE RESEARCH

5.1 INTRODUCTION

The 15FQ+ (Psytech, 2006) is a prominent personality questionnaire frequently utilized, amongst others, in personnel selection in South Africa. The confident utilization of the 15FQ+ in personnel selection in South Africa requires that a convincing argument be developed as to [a] why and how personality (as interpreted by the15FQ+) should be related to job performance, [b] that a structural model derived from the foregoing argument fits empirical data (i.e., there is support for the performance hypothesis), [c] that evidence be available that the predictor and criterion constructs are valid and reliably measured in the various sub-groups typically comprising applicant groups in South Africa and [d] that evidence be available that (at least) race and gender group membership do not systematically affect the manner in which the predictor and criterion constructs express themselves in observed measures. The objective of this research is to contribute to the available psychometric evidence with regards to the third aspect mentioned above.

The 15FQ+ is based on a specific constitutive interpretation of personality. The architecture of the instrument reflects a specific design intention. The structural design of the 15FQ+ reflects the intention to construct essentially one-dimensional sets of twelve items to reflect variance in each of the sixteen latent personality dimensions collectively comprising the personality construct. The 15FQ+items are meant to function as stimulus sets to which test takers respond with behaviour that is primarily an expression of a specific underlying latent personality dimension. Although the 15FQ+ items were designed to primarily reflect a specific personality dimension, they, at the same time, also reflect the whole personality. Each item of the 15FQ+ is assumed to show a pattern of positive and negative loadings on the remaining factors. When calculating dimension scores, these patterns of positive and negative loadings are assumed to cancel each other out in a suppressor action (Cattell *et al.*, 1970; Gerbing & Tuley, 1991) so as to ensure a true, uncontaminated measure of each personality dimension. A specific measurement model is thereby implied in which each specific latent personality dimension comprising the instrument's constitutive interpretation of personality reflects itself primarily (but not exclusively) in the specific items written for the specific sub-scale. It is moreover implied that the freed parameters of the measurement model have values in specific ranges. The design intention of the 15FQ+ is that the items load significantly and moderately strong on the latent personality dimensions, that the measurement error variances associated with the items are low, that the latent personality dimensions explain a moderate proportion of the variance in the items that were designed to reflect the personality dimension and that the latent variables correlate low-moderate with each other.

The objective of the study was to evaluate the fit of the 15FQ+ measurement model on a sample of Black South African managers and to evaluate the extent to which the measurement model parameter estimates conform to the design intentions.

This chapter provides an overview and a summary of the principal findings of the study, discusses the implications of the findings and recommends topics for future research. In presenting the results of this study, the focus is on answering the research questions.

5.2 SUMMMARY OF PRINCIPAL FINDINGS AND DISCUSSION

The measurement model was fitted by representing each latent personality dimension by means of two item parcels. The thirty-two item parcels were formed by combining the twelve items comprising each subscale of the 15FQ+ into two linear composites by taking the mean of the even numbered and the mean of the uneven number items. To reflect on the extent to which it could be justified to combine the individual items into item parcels exploratory factor analysis and item analysis were performed on each subscale. The purpose of these analyses was, however, not only to examine the justification of the formation of item parcels but also to more generally evaluate the claim that each subscale of the 15FQ+ provides an internally consistent and essentially uni-dimensional measure of specific latent personality factors as postulated by the architecture of this measure.

Given the results of the study as discussed in Chapter 4, the following conclusions are made with respect to the dimensionality analyses, the item analyses and the fit of the hypothesized measurement model.

5.2.1 DIMENSIONALITY ANALYSIS

Unrestricted principal factor analyses with varimax rotation were performed on each of the sixteen 15FQ+ subscales, each representing a facet of the multi-dimensional personality construct, to evaluate the success with which each item, along with the rest of the items in that particular subscale, measures the specific personality domain it purports to measure. The purpose of the analyses was to confirm the uni-dimensionality of each of the sub-scales and to determine the extent to which the subscales contains items with inadequate factor loadings (that would under normal circumstances be considered for removal or rewriting). The purpose moreover was to evaluate, via the magnitude of the factor loadings, the degree to which the items reflect the latent variable/variables underlying the subscales.

The eigen value-greater-than-unity rule of thumb and the scree plot as discussed in Chapter 4 were used to determine the number of factors to be extracted. All of the 16 subscales failed the uni-dimensionality test. On all sixteen subscales more than one factor had to be extracted to provide a satisfactory explanation of the observed correlation matrix. The result obtained for the various subscales are problematic not so much because more than one factor is required to satisfactorily account for the observed inter-item correlations but rather the fact that all twelve items of each subscale do not show at least reasonably high loadings on the first factor. In terms of the suppressor action principle underlying the construction of the instrument one would assume either the extraction of a single factor or the extraction of multiple factors but with all items showing adequate loadings on the first factor. The extraction of a single factor resulted in an unsatisfactory explanation of the observed correlation matrix in the case of all sixteen subscales. In the case of all sixteen subscales the majority of items had loadings of less than 0,50 when forcing the extraction of a single underlying factor.

One possibility is that a fission of the primary factors occurred. No meaningful identity could, however, be established for the extracted factors. No common theme was apparent in the items loading on the extracted factors. This makes it unlikely that the failure of the uni-dimensionality test on the sixteen subscales could be explained by a splitting of the primary factors (source traits) into narrower sub-factors. The theoretical basis of the 15FQ+ moreover regards the primary source traits as the fundamental building blocks of personality. The theoretical basis of the 15FQ+ does not make provision for a finer dissection of personality.

The test construction principle of suppressor action would suggest that multiple factors should emerge. The factor structure that should emerge is one in which all twelve subscale items load on a single factor with a random pattern of positive and negative loadings on the remaining factors. This factor structure has, however, not been found.

Judging from the number of factors extracted and the magnitude of the factor loadings when a single factor is extracted, the present study suggests that most of the 15FQ+ items do not satisfactorily measure the personality dimension they purport to measure in Black South African managers. To authenticate this view, more research should probably be done on larger and more representative samples of the population of Black South African managers. However, given the current results, one is bound to conclude that this instrument should be used with circumspection on Black South African managers and that it should be used in juxtaposition with other assessment instruments to cross-validate inferences derived from the 15FQ+ as has been best practice in assessment in general. The current results tend to echo the results obtained by Tyler (2002; 2003) in Asia on a sample that was different from the UK sample in various ways. His findings led Tyler to propose that the 15FQ+ should be adjusted to meet the specifications of his sample. It augurs well for the same principle to be used in this case if this instrument is to be of utility in the South African multi-cultural industrial and organisational setting. If the same argument is followed for this study, given the current results, the researcher would suggest that this measure should be customized to meet local conditions.

5.2.2 ITEM ANALYSIS

The structural design of the 15FQ+ reflects an intention to construct sixteen essentially one-dimensional sets of items that would reflect variance in each of the 16 latent variables collectively comprising the personality domain. The items comprising each subscale are meant to operate as stimulus sets to which respondents react with behaviour that is primarily an expression of a specific underlying primary personality factor. If they do so successfully, the items of a subscale should correlate reasonably high and significantly amongst themselves, reasonably large proportions of the variance in an item should be explained by a weighted linear composite of the remaining items, each item should correlate reasonably high with a subscale total score calculated from the remaining items and the coefficient of internal consistency should be reasonably high for each subscale. However, because of the fact that each personality dimension is conceived to be a relatively broad construct and because each item is designed to primarily reflect a specific personality dimension while to varying degrees also reflecting the remaining personality dimensions, excessively high inter-item correlations, item total correlations and squared multiple correlations are not expected nor considered desirable.

To determine how well the items of a subscale represent a common underlying factor, various descriptive item statistics were calculated. The purpose with the calculation of these item statistics was to detect the presence of poor items. Poor items are items that fail to discriminate between different states of the latent variable they are meant to reflect and items that do not in conjunction with their subscale peers reflect a common latent variable. However, in this study the results on the descriptive item statistics suggest that the items of each subscale are more heterogeneous than would be expected even when taking the suppressor action design principle into account. The items comprising each subscale do not seem to operate as stimulus sets to which respondents react with behaviour that is primarily an expression of a specific underlying primary personality factor. Hence we note the relatively low values of the subscale coefficient alphas. Thirteen of the sixteen subscales (81.25%) showed a coefficient alpha slightly greater than 0,50 but below the general accepted Cronbach alpha of 0,70. Only two scales (12.5%) showed a somewhat acceptable coefficient alpha values slightly above 0,70. Nunnally's (1978) critical stance on the rather liberal cut-off value of 0,70 for evaluating the reliability of measures used in an applied setting should however be kept in mind.

5.2.3 MEASUREMENT MODEL FIT

The measurement model fitted the data well. The null hypothesis of close model fit could not be rejected ($p > 0,05$). The basket of descriptive fit indices indicates a good to reasonably fitting model. The standardized co-variance residuals and the Λ_X and Θ_δ modification indices corroborate this interpretation.

The developers of the instrument argued that the manner in which test takers respond to the items of the 15FQ+ is not a random event but rather systematically determined by specific first-order personality factors. Specifically it is assumed that the items of each subscale primarily reflect a specific personality dimension, that all items to varying degrees also reflect the remaining personality dimensions and that the pattern of positive and negative loadings result in a suppressor action in which the effect of non-relevant personality dimensions are cancelled out when calculating dimension scores. The measurement model depicted in Figure 3.2 explicitly portrays the first part of this argument. The assumption is that the suppressor effect not only operates on the subscale total score level but also on the item parcel level. The fact that the measurement model fits the data closely means that the specific measurement model provides a plausible description of the psychological process underlying the 15FQ+. More specifically it means that the measurement model provides a plausible account of the process that generated the observed co-variance matrix since the pattern of inter-correlations (or co-variances) observed between the combinations of items could be satisfactorily explained by the measurement model.

The fact that the model could closely reproduce the observed co-variance matrix does however not mean that the process portrayed by the model is in actual fact the one operating to determine test takers' responses to the test items. It simply means that the process portrayed by the model is one possible process that could have produced the observed co-variance matrix.

Although the measurement model fitted the data closely, the completely standardized factor loadings were generally of a low-moderate magnitude and the error variances reasonably large.

5.2.4 DISCUSSION

The results of the confirmatory factor analysis suggest that the claim made by the 15FQ+ that the specific items included in each subscale reflect one of the 16 specific latent personality dimensions collectively comprising the personality domain as interpreted by the 15FQ+ is tenable. The results of the confirmatory factor analysis moreover is consistent with the assumption that a suppressor effect operates to cancel out the effect of other personality dimensions in the personality space. The measurement model in which specific items, combined in parcels, were linked to specific first-order personality factors but not to others succeeded in reproducing a co-variance matrix that closely approximates the observed co-variance matrix. The model in that sense provides a plausible account of the nature of the construct that the instrument measures and the manner in which the instrument measures it.

The magnitude of the estimated model parameters, however, suggests that the items generally do not reflect the latent personality dimensions they were designed to reflect with a great degree of success. The items are reasonably noisy measures of the latent variables they represent. A sizable proportion of the variance in the items of each subscale is due to measurement error. This is also reflected in the results obtained in the item analysis and the dimensionality analysis. It should however be kept in mind that personality measures generally seem to be prone to the problem that the reliability of the item measures are somewhat lower than those typically found in cognitive ability and aptitude tests (Smit, 1996). It also needs to be kept in mind that the personality dimensions being measured are broad constructs and that each item designed to primarily reflect a specific personality dimension, at the same time also reflects to varying degrees the other dimensions of personality (Gerbing & Tuley, 1991). Despite these mitigating factors the results obtained in this study nonetheless do give some reason for concern regarding the use of the 15FQ+ for personality assessment in Black South African managers.

5.3 LIMITATIONS

Although the sample size was satisfactory given the nature of the methodology used in this study (specifically the parcelling of items), the method of sampling prevented any claim that the sample is representative of Black South African managers and consequently no definite conclusions regarding the construct validity of the 15FQ+ can be reached for this specific group. Before any structural changes to the 15FQ+ could be considered, it would probably be necessary to further investigate the psychometric properties of the measure with a larger and more representative Black sample than was available for this study.

The measurement model was fitted by representing each of the latent personality dimensions by means of two item parcels. Given the objective of the research to psychometrically evaluate the 15FQ+ as a measure of personality it would, however, have been preferable to fit the measurement model by using the individual items as indicator variables. This was not possible in this study due to the size of the available sample. A follow-up study should however attempt to fit the measurement model with the individual items as indicator variables. Such a study would, however, be faced with the rather troublesome question how to satisfactorily model the suppressor action presumed to originate from the fact that the items of a subscale also display a pattern of positive and negative loadings on the other dimensions of the personality space. The matrix that would be analysed and the estimation technique that would be used would moreover have to acknowledge the polytomous item response format (i.e., never, sometimes, always) of the 15FQ+ items. When analysing the instrument on the item level the ordinal nature of the data would therefore have to be acknowledged. Bontempo and Mackinnson (2006) report that traditional CFA models assume continuous and normally distributed observed indicators. They moreover indicate that if data that violates this assumption is not appropriately analysed, distorted estimates of the measurement model parameters would be obtained.

An important question that has not been investigated in this study is whether the measurement model underlying the 15FQ+ is similar in terms of number of latent personality dimensions and model parameter estimates across Black and White South African managers. The question is therefore whether the 15FQ+ measures the same personality construct in these two populations and whether the manner in which the observed responses to items are related to the latent personality dimensions are the same. The questions can be answered by a series of multi-group SEM analyses in which the measurement model is simultaneously fitted to representative samples from the two populations initially, with all parameters freely estimated. The model is then subsequently simultaneously fitted to representative samples from the two populations with gradually increasing constraints imposed on the equality of the model parameters. The question is whether the model fit significantly deteriorates with increasing equality constraints imposed on the measurement model parameters. If not, it would imply measurement model invariance across the two populations (Bontempo & Mackinnson, 2006).

Demonstrating that the 15FQ+ successfully measures the personality construct as constitutively defined in a sample of Black South African managers, although necessary, would not be enough to convincingly justify the use of the instrument for personnel selection from a diverse applicant pool in South Africa. Neither would demonstrating that the measurement model underlying the 15FQ+ is invariant across racial groups, In addition to demonstrating construct validity and measurement equivalence, it would also have to be demonstrated that specific personality dimensions (e.g., the second-order factors) each significantly explain unique variance in a composite managerial competency measure. In addition, if group membership does explain variance in managerial success (either as a main effect and/or in interaction with personality) that is not explained by personality this should be reflected in the manner in which criterion inferences are derived from the personality assessments. Alternatively it would have to be demonstrated that correspondence to an ideal personality profile significantly explains variance in a composite managerial competency measure. If the manner in which profile similarity is related to managerial success is not the same across White and Black managers, this difference should be formally acknowledged in the manner in which criterion inferences are derived from profile similarity scorers.

Although these limitations are important and must be taken into account, the researcher is nevertheless convinced that this study will contribute to a better understanding of the psychometric properties of this measure on samples different from the UK samples and that the study will indeed trigger the requisite additional research needed to convincingly establish the psychometric credentials of the 15FQ+ as a valuable assessment tool in South Africa. The researcher further believes that this type of study provides an ideal setting for conducting cross-cultural personality research in South Africa.

5.4 RECOMMENDATIONS FOR FUTURE RESEARCH

As indicated in the discussion of the limitations of this study, there are still numerous questions that should be addressed. Proposals for further research on 15FQ+ are suggested below:

- The current study should be replicated on a larger and more representative sample of Black South African managers;
- The measurement model should be fitted on a larger sample of Black South African managers with the individual items as indicator variables by analysing the polychoric correlation matrix via Diagonally Weighted Least Squares estimation;
- The measurement model should be fitted on a larger sample of White South African managers with the individual items as indicator variables by analysing the polychoric correlation matrix via Diagonally Weighted Least Squares estimation;

- The measurement invariance of the 15FQ+ measurement model should be investigated via a multi-group analysis;
- Item bias analysis should be performed on each subscale separately by using the multi-group SEM procedure suggested by Chan (2000);
- The predictive validity of a weighted linear composite of the 15FQ+ second-order factors in predicting performance on a set of generic managerial competencies should be investigated;
- The predictive validity of a profile similarity measure calculated on the 15FQ+ first-order factors in predicting performance on a set of generic managerial competencies should be investigated;
- Predictive bias in the actuarial prediction of performance on a set of generic managerial competencies should be investigated via moderated regression analysis;
- It may also be important to develop and evaluate a local English version of 15FQ+ in future research because most people feel more comfortable in accurately expressing their feelings in a familiar vernacular;
- The possibility of translating the 15FQ+ to one or more indigenous African languages could also be considered although this could potentially prove to be quite challenging in as far as it brings to the fore a number of problems. Not all English terms necessarily have simple indigenous language translations, behavioural denotations of personality traits could differ across cultural groups, separate tests brings back unpleasant memories of a previous political dispensation and the need to equate scores on different versions of the test;
- Finally, one of the most important future research questions to examine would be to evaluate the need to test the accuracy of the notion of the universality of the personality construct and the universality of the manifestation of the personality dimensions across cultures. Personality is an intellectual construct created by man to assist him in thinking about his own behaviour, making sense of it and explaining it. The personality construct mobilized by individuals in different cultures might be different in terms of the nature and number of personality dimensions comprising the construct. Whether such differences are of interest and relevant to Industrial Psychology is however a debatable question. No doubt, this is a question of interest and relevance to a discipline like Cross-Cultural Psychology. Industrial Psychology scientifically studies the behaviour (or work performance) of working man for the

sake of the therapeutic value[19] of such knowledge. From the perspective of Industrial Psychology a more fruitful research theme to explore could be how the various latent personality dimensions affect dimensions of task and contextual performance and how these relationships might differ across cultures. That, however, still leaves the question unanswered as to which conceptualization of personality would be most fruitful to use (assuming differences across cultures). Moreover, in measuring personality carrying the same constitutive definition across different cultures, the question remains as to whether the behavioural manifestations of the personality dimensions might not differ across cultures.

The researcher is of the view that there is a need for innovative research in test development in South Africa rather than just adapting and translating imported tests. Taylor (2005) suggests that this process could be initiated by using existing theories to establish their relevance in a South African context; then initiating the development of psychological theories specific to the South African context. Should this happen, the researcher anticipates that there would be a lot to be gained from such research of individual differences, similarities and uniqueness across cultures that could be of value to Industrial/Organisational Psychologists.

5.5 CONCLUDING SUMMARY

The 15FQ+ (Psytech, 2006) is a prominent personality questionnaire frequently utilized, amongst others, in personnel selection in South Africa. The confident utilization of the 15FQ+ in personnel selection in South Africa requires [a] that a convincing argument be developed as to why and how personality (as interpreted by the15FQ+) should be related to job performance, [b] that a structural model derived from the foregoing argument fits empirical data (i.e., there is support for the performance hypothesis), [c] that evidence be available that the predictor and criterion constructs are validly and reliably measured in the various sub-groups typically comprising applicant groups in South Africa and [d] that evidence be available that [at least] race and gender group membership do not systematically affect the manner in which the predictor and criterion constructs express themselves in

[19] Industrial Psychology scientifically studies the behaviour of working man because such knowledge is instrumental in improving employees' work performance in a manner that serves the interests of the organization and society.

observed measures. The objective of this research is to contribute to the available psychometric evidence with regards to the third aspect mentioned above.

This study gathered data from a large database of the 15FQ+ psychometric test scores provided by Psymetric (Pty) Ltd with permission from Psytech SA. The database comprised individual raw items scores for Black South African managers for each of the items of the 15FQ+ and self-reported information on each respondent’s gender, age, language, disability, referral organization and education. The main objective of the study was to investigate the first-order factor structure of the 15FQ+ through confirmatory factor analysis (CFA). Item and dimensionality analyses were used to determine the extent to which each one of the dedicated items of each of the 15FQ+ subscales satisfactorily reflect the underlying personality dimension it was designed to represent. A measurement model was fitted using item parcelling that reflects the design intention of the 15FQ+.

Results indicate that although the intention of the 15FQ+ to have sets of items reflecting specific first-order personality factors succeeded, the subscale measures of the first-order personality factors generally contain a sizable amount of systematic and random error. The evidence resulting from this research therefore creates a certain degree of uneasiness regarding the utilization of the 15 FQ^+ in personnel selection in South Africa as the available evidence does not allow the conclusion that the 15 FQ+ provides a highly reliable and valid measure of personality amongst Black South African managers in South Africa.

To confidently proclaim the authenticity of these results, there is a need to widen the scope of this research by duly attending to the above suggested recommendations and posed questions that would themselves trigger further research.

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